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See page 20

SANDY QL SPECIALS

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SUPERMOUSE FOR SUPERBOARDS — factory fitted upgrade provides high quality mouse with full pointer/real windowing/multi-tasking front end plus QRAM UTILITIES from QJUMP and CADPAK graphics program.

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CONTENTS

■ ■ MARCH 1987

5	QL SCENE • All the latest news.
10	OPEN CHANNEL • Your views and suggestions.
14	QL EDUCATION • More on learning with the QL.
20	QL GOLD • Do not miss this outstanding offer.
23	BETTER BASIC • Improve your programming.
27	TROUBLE SHOOTER • Consumer hot spot.
32	UTILITY FILE • New software reviewed.
36	DIY TOOLKIT • Build your SuperBasic.
40	ON KEY • We survey the current range of keyboards.
42	PUZZLE PAGE • Another chance to sharpen your wits.
44	TECHNICAL HELPLINE • Write to us with your problems.
46	CONNEXIONS • Build your own interface.
55	THE PROGS • Best of our readers' listings.
58	MICRODRIVE EXCHANGE • The cream of The Progs on Microdrive.



NEXT MONTH

The business

If your QL is the backbone of your business then be sure not to miss the April issue. James Lucy will be discovering which is the best business application to buy, including everything from stock control and invoicing, to cashflows and accounts.

Consumer Advice

Our QL Troubleshooter Bryan Davies gets into full swing by sorting out your consumer troubles. If you are experiencing difficulty in gaining a sympathetic ear from a retailer, write to us.

Psion Solutions

If you have a problem with any of the Psion suite The Psion Solutions team will sort it out. If you write now you could be one of the first. Keep it short, that way we can include more.

FIRST OF ALL THERE WERE THE GOLDEN AGES THEN CAME THE GOLDEN YEARS AND NOW THE GOLDEN SERIES FROM ULTRASOFT

TOOLBOX II (v2.20)

Reviewed in QL World 11/86: 'A toolkit with a difference'

The fastest backup utility available for the QL. Uses only Superbasic extensions with full error trapping. Make exact MDrive format copies. Clone to any device and between any devices, even single floppy drives. SAFE, SURE, CERTAIN, PRECISE AND FAST FILE HANDLING in a user friendly packet. Comes with FREE Ultrasoft standard and dynamic RAM-Disks, real multitasking interrupt clocks (depress ALT-SHIFT), a memory cut-off program and a professional diskmonitor.

If you want to work with RAM-Disks or need any backup copies, you cannot afford to be without this program. Comes with a comprehensive manual. DM49.90 £14.95

QKICK (v3.0)

Reviewed in QL World 1/87: 'Qkick is an extremely useful addition to any routine library and will not very easily be equalled'

QKick is the first real multitasking program for the QL, running in different interrupt levels in the background of any program. All usual desktop facilities. Notepad, Diary and a full database for the serious user, including a data transfer facility to the foreground program, i.e. while working in QUILL, find an address you need and transfer it straight from QKick into QUILL. Scientific Calculator with Algebraic Operating System and data transfer. An automatic screen switch-off routine to prolong the life of your monitor. Full disk, file and memory monitor, job control, screen save and many more.

MANY GOOD AND WELL KNOWN PROGRAMMERS SAID IT WAS IMPOSSIBLE TO WRITE. Comes with a fully documented manual. DM84.90 £24.95

FULL HOUSE

Reviewed in QL World 11/86: '... it is good fun to play, worryingly addictive ...'

100%. Machine code. Superb colour graphics. You need nerves of steel to play. A fruit machine poker game completely identical to many machines found in German pubs. DM39.90 £12.95

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Now you can write your own customised graphics program in minutes, i.e. a package like EYE-Q (copyright Digital Precision) should be possible with about 8 KB of Basic, which can be compiled if necessary.

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Turbo blows hot

The Digital Precision long-heralded new SuperBasic compiler is at last available. *Turbo* builds on the success of the well-established *Supercharge* and allows a SuperBasic programmer the same access to the quick-loading, fast-executing, multi-tasking benefits of machine code.

Many improvements have been made compared to *Supercharge*. *Turbo* is not copy-protected, although there is special identification built into each copy, so people who have perfected the one-eyed squint required by Lenslok need no longer maintain their art. Ease of use is a strong point, the program being run from a front panel, allowing simplified setting of the wider range of options and control parameters.

The rigorous approach of *Supercharge* to program syntax checking has been relaxed and there is an auto-correction feature which will attempt to correct errors in

the source SuperBasic. Compilation of programs happens much more faster, the code generated is significantly smaller, the *Supercharge* 64KB code limit has been removed, and yet the finished programs run faster, albeit by a relatively modest amount.

Serious programmers will welcome implicit datatypes, which allow for integer FOR loops and string SELECTS and the ability of tasks to communicate and even to share procedures and functions. The manual is

gigantic and as comprehensive as you could wish. *Turbo Toolkit*, previewed in the January issues is included, too.

Digital Precision has obviously laboured long and hard and kept customers waiting as a result but by now everyone who has ordered *Turbo* should have received a copy. We will be reviewing it in detail in the next issue, when we will discover whether it shares with its automotive counterpart the characteristic of being driven by hot air. We doubt it.

Facelift for Taskmaster

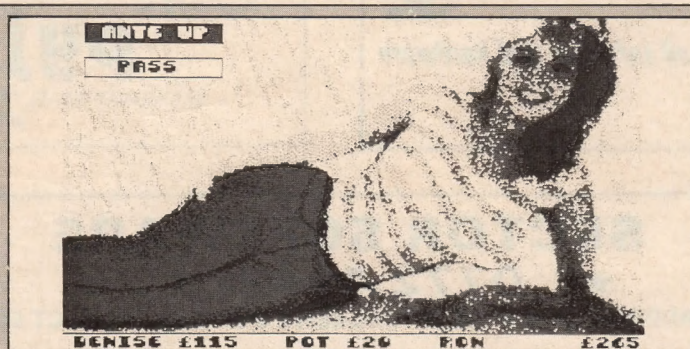
Taskmaster, the multi-tasking front-end program from Sector Software, is due to undergo the upgrade treatment only four months after its release at the November '86 ZX Microfair.

Whereas *Taskmaster* currently reserves 32K of memory per program for screen requirements, in the new version that is optional. Further, it will be possible to allocate screen memory for a SuperBasic program.

The new *Taskmaster* will also be fully-compatible with the Eidersoft front-end ICE and the Psientific Software *Key Define*. The problem with using *Key Define* under *Taskmaster* is that both programs compete for the ALT key. Thus, any attempt to call a *Key Define* macro from within a *Taskmastered* Quill results in disaster.

Other enhancements include a notepad facility which can be called from the information desk in the same way as the File editor and calculator. All three facilities can be loaded optionally from the boot, so memory can be conserved if necessary by omitting them.

The new version will sell at the old price of £25. Existing users can obtain the upgrade by returning their cartridge with £5 to Sector Software, 39 Wray Crescent, Ulmes Walton, Leyland, Lancashire. Tel: 0772 454328.



Dirty Denise

Software File is taking a break this month. There are too many serious things to be looked at. It will return next month with the usual reviews, plus the joystick round-up we promised in February.

Meanwhile, some of this month's games releases could be accused of bordering on the pernicious. *Strip Poker* from Talent, for example, is a card gambling game, the object of which is to remove all the clothes from a digitised Denise. *Strip Poker* has been successful on other micros, like the Atari ST which has the benefit of excellent graphics. Regardless of the graphics, *Strip Poker* is such an appalling idea it will undoubtedly be successful.

The *Pyramide Super Croupier* allows you the luxury of a flutter without having to stand semi-naked in

front of your monitor. There are six games including roulette, blackjack, baccarat and poker — good, clean stuff.

Caret Computers is a newcomer to the QL software scene. Its *Omega* game is more in the traditional arcade adventure style. There are 10 levels and more than 500 locations. Alas, the game is so vast that it will run only on an expanded machine.

What a CAD

'The largest and most sophisticated CAD package for the Sinclair QL' is the claim made by Datanet Systems for its latest release, *Pro CAD 3*.

The program creates three-dimensional wire-frame models from 2D plan and elevation drawings. Features include rubber-banding, magnification, 3D rotation and prospective options and powerful editing and copying facilities.

Final copies can be produced on a dot matrix printer and the package includes a driver for Epson-compatible plotters. *Pro CAD 3* costs £35 and is available from Datanet Systems, PO Box 121, Luton, Beds. Tel: 0582 418492.

Beating the bank

Those who have difficulty keeping track of their bank balance might find some use for the latest release from S D Microsystems. *QL Bank Account* will keep a record of all of your transactions and is suitable for personal use and for small businesses with a

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THIS IS WHAT QL WORLD HAD TO SAY ABOUT THE PROGRAM

"Succeeding admirably as a serious course intended for beginners and experienced typists alike, Touch Typist is a well presented useful utility which includes the professional polish of good quality software" - QL WORLD, JULY 1986.

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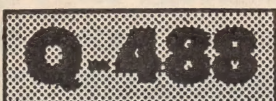
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The best-selling floppy disc interface (now issue 4) is fitted with a 16K EPROM containing many 'Toolkit' extensions, and CST's new Ram Drive 2. It may be used with most 3.5" or 5.25" floppy disc drives, CST's own twin slimline double sided 80 track 3.5" units being exceptional value for money, with 720K of formatted storage per drive. The Toolkit provides a wide range of SuperBASIC commands and functions designed to improve access to the powerful facilities of the QL without the need for machine-code programming. Job control is made easier, files can be used for random access, alternative character sets can be produced, 'wild cards' can be used in file operations, etc.

The Ram Drive device driver allows free memory to be used as though it were a very high speed disc, in fact the fastest such device when used with the RAM-plus. Ideally used for the storage of temporary results, or multiple screen images for animated displays, it also eases the copying of files in single disc systems. The Ram Drive can only use memory which is free, so the full advantage is only felt if the QL is equipped with additional memory. Built into QDisc 4 and Thor, the Ram Drive is also available on 3.5" and 5.25" floppy disc.

The CST RAM-plus unit expands the available memory of the QL to the limit of 640K. Using high grade 256K memory devices, this unit is the only one which offers the high performance of no wait-state operation. Housed in a rugged metal case, the RAM-plus unit has an expansion slot which duplicates the QL's, allowing any other CST peripheral to be used. Among the advantages derived from using the RAM-plus are the performance improvements of software and storage devices, and the ability to multitask several programs at once.

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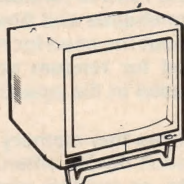
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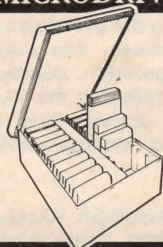


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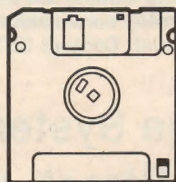
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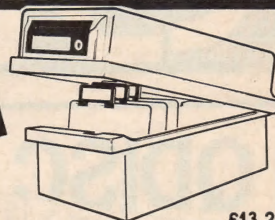
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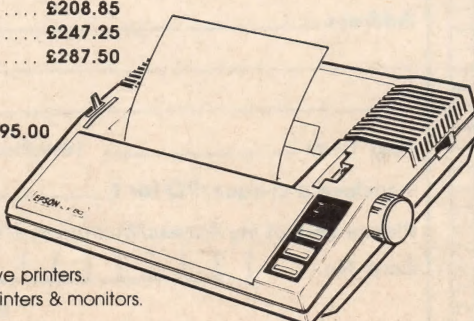
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OPEN

Lack of approval

In the November, 1986 issue, a short review of the Miracle Systems QL modem was published. Although the article was generally favourable, it stated that the modem does not have British Telecom approval.

The article quoted a Miracle Systems representative, who suggested that approval would probably be given if it were applied for, implying that the modem is suitable for connection to a British Telecom line.

The legal position, as I understand it, is that it is a criminal offence to connect a non-approved modem to a British Telecom line. Therefore I consider it ill-advised to print the comments of the Miracle Systems representative, who seems to be suggesting that it is immaterial whether British Telecom approval has been given or not. Or, perhaps, is there a suggestion that there

is nothing wrong in committing a criminal offence if the chances are you will not be caught?

**Donald Paterson,
Stenhousemuir.**

Editor's reply: You are correct to suggest that connection of unapproved equipment to BT lines is an

offence. The remarks made in the news item to which you refer are those of Miracle Systems and are not necessarily those of Sinclair QL World. Having said that, it is an undeniable fact that due to the protracted process of acquiring BT approval a great deal of unapproved equipment is both sold and used in the U.K.

More on Mandelbrot

I was somewhat surprised to read James Lucy's article on the fascinating graphics derived from the Mandelbrot Set, as I have been working on this and was considering writing an article on the subject.

I can, however, make some further observations on the problems generating the images. I converted my version of the Basic program to C and compiled it using the Metacomco compiler and found the running time of about 20 hours scarcely improved. It would thus seem that the floating point calculations take all the time and the loop overheads and colour plotting have little effect on the time, whether interpreted by Basic or compiled in C.

It also follows that coding the program in assembler would make little difference, assuming you could fathom the QL floating point interface in the first place. It was interesting to note that Transtech claims to have reduced the running time of the basic Mandelbrot diagram to two hours by improving the floating point routines.

I took a different approach and reverted to fixed point arithmetic, in assembler. This is where the M68000 32-bit integer capability is used, with the conceptual use of a binary point, the computer equivalent of a decimal point. That is to say only a certain number of bits

in the top end of the word are considered to be integer and the rest are fractional bits. Special arithmetic routines are required to handle multiplication and division of the 32-bit integers, using 64-bit intermediate results; the final results are scaled down so that the 32-bit answer with the implied number of fractional bits is retained.

In this case, I used 28 fractional bits, giving a representative smallest bit value of approximately four billionths. Using this scheme, a run-time for the basic diagram of 20 minutes is achieved and similar times for other diagrams. Only at very high magnifications does resolution become poor,

Pen friend

I am a student at a secondary school for computer technology. My interests are the English language and computers. I have a QL. I want to join both things and so I am looking for a pen-friend from the readers of *Sinclair QL World*. If anybody is interested, here is my address:

**Gregor Smrekar,
Polhov Gradec 122,
61355 Polhov Gradec,
Slovenia,
Yugoslavia.**

so there is plenty of scope for experimentation, which is feasible with the given run times.

As Lucy suggests, many optimisation possibilities exist and the topic is a fascinating one, being very simple to program. A notable article on the subject appeared in *Scientific American* not long ago, and has attracted a good deal of academic research, based on super-computers such as the Cray 1.

**D. Healer,
Harpenden,
Herts.**

Better play

I own a QL on which I mainly play games. I am 15 and have found that some games are better played using the cursor control keys but too much use of those keys will wear them out. I was wondering if there is a joystick for the QL which has, instead of a stick, buttons to act as the cursor control keys and fire button?

I am sure that I am not the only QL games player who has met this problem. Is it possible for them to be made to order, for I am sure they would be well received by most QL users?

**Kieron Salmon,
Marlborough, Wilts.**

Editor's reply: The April issue will have a complete round-up of joysticks for the QL games player. The Euromax Wizard is what you need and is one which we will be looking at.

Neglected intelligence

I would like to draw attention to a book published by McGraw-Hill. The author has chosen QL SuperBasic to show how aspects of artificial intelligence can be demonstrated.

Of special interest to QL World readers may be the author's reasons for choosing SuperBasic. He says: "SuperBasic is one of the most advanced Basics and is therefore eminently suitable for this type of work."

At the Advice Centre we hope to use AI techniques to help part-time workers cope with the complexities of welfare regulations. It would be helpful to us if you could

find space for articles dealing with AI, a rather neglected facet of the QL capabilities.

**Eddie Ross,
Northway Community
Centre,
Westlands Drive,
Headington, Oxford.**

Editor's reply: An extensive series on Artificial Intelligence was published in QL User from September to November 1985. You do not mention the title of the book or the author but if sufficient interest was shown we could give more coverage to AI topics.

CHANNEL

Suggestions

I am new to the QL, despite having it for about a year. There is still plenty of time to learn and this magazine will help me doing so. Having read it for some time, I would like to make some suggestions.

More explanation could be given on how to use the programs in the The Progs, especially for the utilities.

A new way of summarising software in the Software File and Utility File section e.g., giving a star or a value for performance, interest value.

A R Abraham,
Glasgow.

Editor's reply: No sooner said than done. You will notice that this month's program, 3D Designer, has more extensive documentation. That will be the case with future Progs. We like to think you can judge software reviews by what the reviewer has to say, but are considering something on the lines you suggest.

Small complaints

I recently bought my first copy of *Sinclair QL World* and I would like to congratulate you on a first-class magazine. I have two very small complaints.

In the Progs section, you featured a program by A Price, *Balloons*. While I found it entertaining, entering it was a different story. The reason was the irregular line numbering, hence the AUTO command cannot be used. The QL has a RENUMBER command, so why not use it to tidy the listings before publication?

Included in the article Compose Yourself, an assembly listing was published. Not everyone has a compiler, so why not publish the hex codes with the listing? Even if the machine code can be executed only from one memory location, it still beats trying to assemble it by hand.

D. Stewart,
Kilwinning,
Ayrshire.

Editor's reply: To take the second question first. It is the policy of the magazine to include SuperBasic Hex loaders with assembly listings but that is not always possible for reasons of space. It is very rare for us to publish unaccompanied assembly listings.

Re-numbering listings is certainly a good idea; meanwhile it would help if Progs contributors could supply evenly-numbered listings printed across 50 columns.

Future market

I am writing about the future of the QL. Being a new user of the QL, its future is of some importance to me. I should point out that I am a computer engineer. I started on micro PC compatibles — and now work on DEC equipment.

I am surprised at companies like Eidersoft and Sandy trying to sell a QL which costs more than the equivalent Amstrad PC look-alike. If I were going to spend that amount on a home computer I would choose an Atari ST.

The real way forward for the QL, as I see it, is software. If one, or better still all, of the companies putting their efforts into saving the QL wrote games, a real market would open for

Belgian contact

I want to bring the following to your attention. I was very surprised to read in *Open Channel* that a Belgian QL owner did not seem to know where he could get information in our country on QL matters. The contact address of our club is QL Limburg, Gebruikersgroep (QL Users' Group Limburg), Houterstraat 100, 3762 Gellik, 011/714813.

I can tell you we in the north-east part of Belgium have a very active, still growing QL club. We are publishing a bi-monthly bulletin and are organising training courses. We are living in the Dutch-speaking part of Belgium and so we have several members from the Netherlands.

We look forward each month to our copy of *QL World*. It is appreciated as an excellent bulletin on the QL. Many thanks.

M. Beckers,
Gellik,
Belgium.

Speed printing

Why struggle with slow Basic-written screen dump programs? If exact scaling of graphic printout is not required, Easel printer drivers can be used easily. This can be done with the following statements:

```
screen_dump = respr(2000)
lbytes mdlv_gprint_prt,
screen_dump call
screen_dump
```

RESPROC-size and printer driver name should be fitted to the individual environment; users of a German QL always use TRA 0.

The ratio of width to height of a printed square will be approximately 1 to 2. If you can tolerate this, you will be pleased by the performance of the program.

Recently I bought a 256K RAM card from Sandy, which speeds processing

remarkably. Unfortunately it becomes hot and the QL does not stand it for more than an hour or so. I have not yet discovered whether this card is defective or not. Apart from this, is heat a general problem with the QL? If yes, what can be done?

Franz Kahlig
Vienna.

Simple solution

Patrick Dorly wrote about problems with Sagesoft QL Accounts. I too, found Sagesoft, including its, programmers, mystified by the aimless spinning of mdv2 when I tried to initialise the cartridge.

The solution, if inelegant, is very simple — CRUN the initialise routine but without the cartridge in mdv2. An

error message will be displayed, showing that it was trying to open a non-existent file. Note the filename. Now go to Basic and save a dummy file of the same name by <save mdv2—filename>.

Now CRUN initialise routine again.

Tony Bowyer,
London E5.

the QL. A friend with whom I work was thinking of buying a computer for his children's use for Christmas. I recommended that he bought a Spectrum because there is a complete lack of entertainment software for the QL.

At its current price level, the QL must be the best bargain in home computers. My children — one four, one seven — love Eidersoft *Karate*. I use the Psion packages a good deal and feel they are fine for home use.

So all you companies which manufacture QL add-ons, do not do what Sinclair did; aim it at the current market. There are many people who are gradually outgrowing their Spectrums and the QL should be the way for this.

Peter Morris,
London E6.

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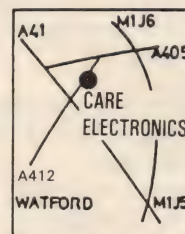
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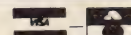
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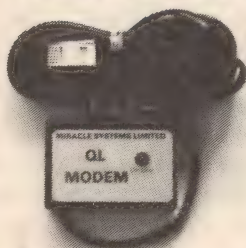
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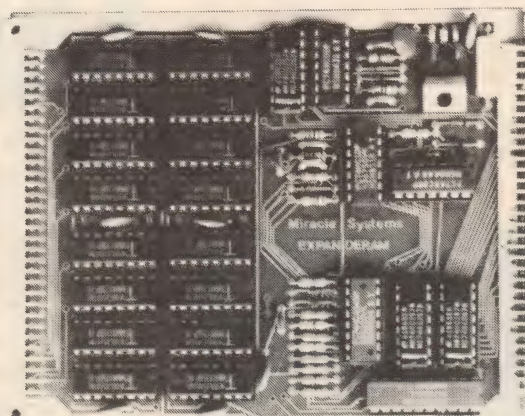
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In his introductory article Leslie Fahidy covered the basic principles of Education using the computer. This month he looks at the importance of program structure.

QL EDUCATION...

When we examined structure last month I did not tell the full story. I said that it was important to structure any teaching material but I used no structure in its programming sense. This month we start with a discussion on structured programming.

Structured programming has nothing to do with structuring the teaching material; it is more a question of programming style. These days it is usually considered that elegant programming means structured programming. I do not know when a program is elegant so I do not approve of that use of the phrase. In programming we are not dictated by fashion but by necessity and to understand the necessity for structured programming, and to understand the concept, we should make a historical detour.

In the dark ages — 10 or more years ago — memory was the all-important keyword in programming. Any computer system having 16KB of memory was respectable. The unexpanded QL, with its huge 128K of RAM, seems almost over-kill compared to systems of not long ago. The bonus, of course, frees us of many of the worries with which programmers of more than five years ago had to contend. In those days, the most important task for the more mature programmer was to squeeze the program into as few bytes as possible.

Naturally, that requirement bred its own programming style. It resulted in extremely clever tricks; so clever, in fact, that even the programmer could not understand it a short time later, not to mention the inability of anyone else to read and modify the program at a later date.

Understanding

Luckily, memory became cheaper all the time, allowing us to concentrate on the easy understanding — often called maintainability — of a program, rather than the number of bytes it occupied in memory. Thus structured programming was born. Its main aim is to write programs which are understood easily by all who know that lan-

guage, without extensive paper documentation.

At one time many people, who should have known better, maintained that the only way out of the problem was to dispense with Basic altogether and start programming in Pascal or some other so-called, structured language. Of course Pascal is an excellent language — I use it frequently and I love it — but it is not true to say that we cannot write Basic programs in a structured way. QL SuperBasic is in a particularly good position as a candidate for structured programming. It has the all-important facility of named procedures.

Clearly, named procedures must have something to do with structure but it is not the whole story. We concentrate now on procedure and examine other aspects of structured programming later in the series.

In a way, procedures are not very different from subroutines, except for the way you invoke them. Suppose that every so often in a program we need to clear the screen and display a certain message at some point. If that action is needed more than once in a program, it would pay to use a subroutine to accomplish it. That task could be achieved by the following subroutine:

```
10000 CLS
10010 AT 5, 10
10020 PRINT "This is the mes-
      sage."
10030 RETURN
```

The subroutine must go at the end of the listing or the program may slide into the subroutine, with disastrous consequences. Each time we wanted to invoke this action, say in line 120, we would write:

```
120 GOSUB 10000
```

That is a significant improvement on having to write that section of code every time it is needed; we may 'GOSUB' to 10000 as many times as we like from any part of the program — it will always have the same effect.

The snag with subroutines is that we will have to remember where the subroutine starts, or we cannot call it, and by the time we have 20-odd subroutines operational in any program, it is



not easy to remember which does what. Moreover, every so often it becomes necessary to re-number a program and such action would, of course, completely invalidate all the subroutine addresses which we remembered so painfully. There is one point, probably most important of them all, the line GOSUB 10000 is completely meaningless to anyone but the person who wrote it and can remember what that subroutine does, or is willing to look it up from 10 or more pages of listing, thus losing concentration.

Helpful

It would be more helpful if we could refer to a subroutine, i.e., call it, by a name rather than a number. If the quoted line could be 120 DISPLAY_MESSAGE ... it would be much more useful. That is exactly the facility available in SuperBasic.

It is a little like adding an extra keyword to the vocabulary of Basic.

Once you have defined a procedure, you may use its name and the computer will take the same action as if that name was one of the reserved words, defined by the language. DISPLAY_MESSAGE says clearly what will happen, unlike GOSUB 10000.

Naturally, you have to pay a price for this. A procedure executes more slowly than a subroutine. That is understandable; the interpreter not only has to execute the program section but first it must find it. There are other aspects of using procedures, namely the use of local variables and passing parameters, all of which will be discussed in a later article.

We used procedures in the first article of the series with no explanation. If you look at lines 2000, 2100, 2200, 2400, 2600, 2800 and 3000 of listing one in the February issue, you will find that all lines define procedures. A closer look will also tell you how to define a procedure.

The first line of a procedure defi-



nition must start with DEFine PROCedure any_name; the rules for the procedure name are the same as for file names.

The last line of the definition must be END DEFine. The distinction between upper- and lower-case letters is not significant, SuperBasic will insert them for you, no matter what case you typed.

Procedure definitions may be placed anywhere in a program but it is customary to put them at the end. Once defined, a procedure may be called by its name. There are some more rules pertaining to procedures but those three will do to start.

This month's article includes two procedures, in listings one and two, I mentioned last month that the program was not entirely satisfactory from the point of view of how it deals with mistakes. Once the learner has made a mistake it becomes necessary to explain by a different method how to calculate percentages. I have chosen a simple mixture of graphical and verbal explanation which will take effect only if the user supplied an incorrect answer.

Percentages

The first procedure in listing one, called Teach, runs from line 3250 to 3730. Try it after you typed it in, or obtained it from Microdrive Exchange and you will find that on the top of the screen it will give a generalised explanation of how to calculate percentages more or less along the lines of how the original, purely verbal, explanation did, but it will refer to the specific number and the specific percentage of this example, rather than talk in general of the number and the percentage.

The bottom half of the screen is split into two halves. The left-hand side shows, using asterisks, how to calculate the percentage of the whole hundreds of the example while the right-hand side explains, in words and numbers, how the total percentage is

Listing 1.

```

3250 DEFine PROCedure teach
3260 REMark graphic display
3270 REMark DON'T FORGET TO CHANGE LINES 970, 2110 AND 2220 IN
      LAST MONTH'S LISTING!
3290 CLS:AT 0,0
3300 PRINT"How to calculate " ;P;" percent of ";N;"?"
3310 PRINT FILL$("- ",36)
3320 AT 2,0:PRINT"From every 100 we take ";P;" (PERCENT)"
3330 IF N=199 THEN
3340 PRINT"There is 1 hundred, ":"from that we":PRINT
      "take ";P;" and"
3350 :ELSE PRINT"There are ";INT(N/100);" hundreds,so we take "
      ; INT(N/100)*P:PRINT"from ";INT(N/100);"00 and ";
3360 END IF
3370 PRINT(N/100-INT(N/100))*P;" from the remai-":PRINT"ning ";
      N-100*INT(N/100);"."
3380 PRINT"Altogether, the ";P;" percent of ";N
3390 PRINT"is: ";N*P/100
3400 AT 9,0:PRINT P;"% ":"of 100=";P
3410 counter=0:AT 10,0
3420 FOR outer_loop=1 TO 10
3430 FOR inner_loop=1 TO 10
3440 counter=counter+1
3450 IF counter/P THEN
3460 INK 0:ELSE INK 4
3470 END IF
3480 PRINT"*";
3490 END FOR inner_loop:PRINT
3500 END FOR outer_loop
3510 INK 7
3520 FOR j=9 TO 19
3530 AT j,15:PRINT"| "
3540 END FOR j
3550 AT 9,17
3560 PRINT"The ";P;" % of ";INT (N/100);"00":" is: ":"AT 10,17:
      PRINT INT(N/100);" x ";P;" = ";P*INT(N/100)
3570 AT 11,17:PRINT FILL$("- ",20)
3580 AT 12,17
3590 PRINT P;" % of the remai-"
3600 AT 13,17
3610 PRINT"ning ";(N/100-INT(N/100))*100;" is:";
3620 PRINT(N/100-INT(N/100))*P
3630 AT 14,17:PRINT FILL$("- ",20)
3640 AT 16,17:CSIZE 1,1:FLASH 1
3650 PRINT"Answer=";N*P/100:CSIZE 0,0
3660 AT 18,17:FLASH 0
3670 PRINT"Press any key."
3680 a$=""
3690 REPeat inner_loop
3700 a$=INKEYS
3710 IF a$="" THEN EXIT inner_loop
3720 END REPeat inner_loop
3730 ENd DEFine

```




calculated. Also on the right-hand side, the correct answer is flashed at the user, in rather large characters. There is nothing to prevent you devising your own method of explanation and programming it yourself; do that and replace the procedure with your own method.

We will, of course, have to make some minor alterations to the main program — last month's listing — as well; after all, if we do not call our newly-written procedure, it will never be used. Line 970 should now read:
907 IF answer\$ < > N*P/100 THEN

incorrect:teach:new_screen:
ELSE CORRECT

You may notice that a new word crept into line 970, apart from Teach, which we have already discussed; the word is new_screen. This is also a procedure, shown in listing two. Let me explain what the procedure does and why it is necessary.

Messages

If you ran last month's program a few times you will have noticed that certain messages are displayed permanently on the screen. The procedure Teach has wiped-off those messages with a CLS. It had to, since Teach needs the whole screen for its display. After the further explanation given by Teach had run and had been learned we must re-instate those permanent messages on the screen. That is the task of new_screen.

You may also have spotted that new_screen does this in the same way as the original program, since it produces the same display. That should tell you something. The message is that in the appropriate place in the original program we should use new_screen; after all, there is no point in writing the same

code twice but it is left as an exercise for you.

There are two other alterations to the original program which you should carry-out. Re-write line 2110 to read:
2110 N=RND(100 to 999)
and line 2220 should become:
2220 IF P>35 THEN LET P=INT
((P + 100/2)

Those alterations will not modify the original program significantly but they are necessary. The first one at line 2110 is needed to make sure that the number is never less than 100, or it would have no meaning to say that we show how to calculate the percentage of the whole number of hundreds. The second alteration, at line 2220, is merely cosmetic. It prevents the required percentage being a decimal fraction. With a semi-graphical display that is important; a fractional percentage could easily lead to a final answer containing several decimal places and such an answer may not fit into the available display space.

Teaching methods

I would suggest that you carry-out one more modification to our program, along the following lines. There are basically two methods of teaching anything, linear and circular. In linear teaching you would start with the simplest concepts of a particular topic and explain it until you have exhausted that topic — not recommended. In the circular method of teaching you explain a

certain amount, then leave the topic, start doing something else and return to it later, when the first part of the explanation had time to be digested. The circular method is far superior.

Grading

To put this into effect in our program, it is necessary to grade the examples used. You can decide what criteria of grading you wish to use. I would suggest the easiest grade, those examples where both number and percentage are whole numbers; intermediate grade, examples where both number and percentage may be fractions — remember, though, you cannot use the procedure teach with this class; and, finally, difficult grade, in addition to those mentioned previously. The percentage may be a number greater than 100; this is more difficult since, to the beginner, it does not make sense how you could take more than a hundred from a hundred. Bear in mind you will have to modify Teach to implement this change.

Work on a procedure to achieve these results or something similar. In next month's instalment we will deal with different aspects of structured programming.

Not only shall we take it a step further, to include algorithms and flow-charting, but also change our topic. Instead of teaching maths, we shall write a program together to teach spelling.

Listing 2.

```
4000 DEFine PROCedure new_screen
4010 CLS:CLS#0
4020 FLASH 1
4030 PRINT"To find the ";
4040 INK 1
4050 PRINT"percentage ";
4060 INK 7
4070 PRINT"of a "
4080 INK 4
4090 PRINT"number:"
4100 INK 7
4110 FLASH 0
4120 PRINT:PRINT"Multiply the ";
4130 INK 1
4140 PRINT"P";:INK 7
4150 PRINT"ercentage by the ";
4160 INK 4:PRINT"N";
4170 INK 7:PRINT"umber and divide by";
4180 PRINT" 100"
4190 AT 5,0
4200 UNDER 1:PRINT"Exercises.":UNDER 0
4210 END DEFine
```


The icing on the cake

SOFTWARE RELEASE

The ICE desk-top firmware is well-established and provides fast, convenient housekeeping facilities. It was early on the scene and

lacks some of the features users expect today but Icicle helps bring it up-to-date and is fully-compatible with it, working with either the cursor keys or the mouse. That is not to say that Icicle is only for ICE users; it can be used in any system configuration. Many users regard *Key Define* as an essential tool for streamlining daily operations; Icicle is from the same writer and is designed to fulfil the same role, but to do it by means of a window and a set of icons.

Apart from the obvious attraction of visual presentation — Icicle is very good in this respect — icons have the advantage of enabling complicated actions to be represented in an easily-recognisable fashion. An example is the Loading and Saving of files on a regular basis. Now that multi-tasking switch programs are available, the user can be creating or updating four or more files in parallel and simple mnemonics (ALT+L) are no longer sufficient to describe all the actions needed. With Icicle, you draw pictures to represent each file and put the text "Load" or "Save" beneath them. If the operation is to be performed to several devices, "to flp1_" or such can be added.

Getting the point

The program is on cartridge, with instructions being provided in the current style of a Quill file. If you miss this point, it will soon be brought to your attention when a DIR of the cartridge is made; the rather obscure names, including several complete blanks, to some of the files then form a warning to read the instructions file. The files can be backed-up to any medium and the installation file can be made to run from disc by using the usual mdv-flp conversion routines. Running the boot file brings up a menu offering the choice of exec-ing existing Icicle files, making new ones, or copying the cartridge. There are two categories of Icicle file, those for use with SuperBasic — program development — and those for use with programs, e.g., the Psion quartet; there is a separate installation program for each.

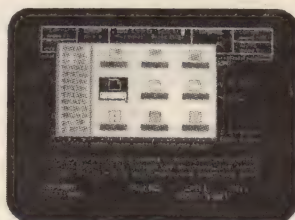
Once into the installation program, you load either the supplied sample _Icicle file, or any later version you may have created, then select from a second menu — design icons, put mes-

sequence <F3>, <Load>, <flp2_current_doc>, <Enter>. That is an obvious instruction to give to a Psion program; a less obvious use is to

Bryan Davies reviews Icicle, successor to Key Define and Quill labour-saving device.

sages under icons, edit the strings defining the actions, define the keys for switching the Icicle window on and off, set the printer baud rate and change the devices, set the default spooling job, or save the new version.

Each of the routines has simple on-screen instructions. There are 54 icons available, of which half have just a block for text and half have a text block plus a picture block. These are split



The attraction is obvious

into three pages, each having nine text-only blocks down the left side, and nine picture and text blocks to their right. Moving from page to page is by the usual ICE method — move the pointer to the Page icon and press space or click the mouse button.

The messages in the text icons can be of up to nine characters and are purely descriptive — they tell you what action that icon produces but have nothing to do with producing it. Samples are "Go to Top" and "Save to 1". If there is need for more text than can be fitted into a text block, it can be part of a picture. They are drawn on a 16 by 24 grid, which allows fair realism. Pictures can be recalled and modified and saved to any number of the 27 icons. Having entered messages and drawn pictures, the edit function is used to produce strings for performing the actions. A typical string is:

```
<340 P_15$=CHR$(255)&CHR$(15)
&CHR$(240)&'flp2_current'&
CHR$(10)>
```

340 is the installation program line number, P_15\$=CHR\$(255)&CHR\$(15) denotes the 15th icon, and the remainder is the familiar Quill command

change printer drivers. Provided you enter a command the program in use can understand, it will be executed; Quill uses the Backup command, so this can be utilised in a string which passes the message "backup new_printer_dat as printer_dat, overwrite".

The string can be all text, such as a name and address. It can also be used for date-stamping, provided Icicle is updated each day. That brings out another feature — the string for any icon can be changed at any time by typing-in a new string from SuperBasic. The change will have effect only until the QL is re-set; long-term changes are made with the installation program.

There are an additional six icons across the bottom of the window — DIR, LOAD, MERGE, IMPORT, SPOOL, ESCAPE. The last two are fixed and call the built-in spooler, or erase the window, respectively. Erasing the window leaves whatever was underneath it intact.

The spooler is a considerable improvement on earlier types, allowing up to five jobs to be queued, with the options to Start, Stop or Escape from them. A regular spooling job can be set permanently as job 1 during installation. A useful item is the facility to send any number of 'Translate' strings to a printer.

The other four icons are self-explanatory in use, a device selection menu appearing first, followed by the list of files found. The order of devices on their menu can be changed with the installation program. As the command lines for those four functions vary slightly between the Psion programs, they can be defined by the user.

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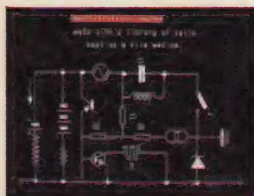
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BETTER BASIC

Mike Lloyd explains how to use KEYROW to test for user input

Every Basic dialect has a keyword which everyone loves to hate and my nomination for the wooden spoon in SuperBasic is KEYROW. Reading its description in the User Guide is not for the faint-hearted but KEYROW has a number of advantages over the more common INKEY\$ command and so it is worthwhile spending some time curbing its worst excesses.

INKEY\$ reads the keyboard and returns the ASCII value of any keypress it detects. It is slowed by the need to look up the ASCII value of the key and by a firmware-controlled delay which controls both the time a key has to be held down before it repeats and the slightly shorter delay between subsequent repeats. KEYROW has none of those constraints and is therefore much faster at registering a keypress. KEYROW can also detect the three keys which do not have an ASCII value — SHIFT, CTRL and ALT. Finally, KEYROW values are unaffected by the mode of

the keyboard — i.e., whether CAPS are on or off.

by combining them into a single value. Another is to force a pause in the

which represents each of the KEYROW rows in turn. When a key is pressed the function jumps to a RETURN statement within which the values of row and col are converted into a single figure.

Converting the row and column values into one number would have been relatively easy if KEYROW columns, like the rows, were numbered 0 to 7. They are given values of 2 raised by a value between 0 and 7, a range of zero to 128. The conversion process therefore has to begin by finding the exponent of 2 which would give the column value. That is done using the LOG10 function. The result is multiplied by eight and then the KEYROW row value is added.

The listing has been

Listing 1.

```
100 DEFINE FUNCTION keytest
110 LOCAL row,col,loop
120 REPEAT loop
130   FOR row = 0 TO 7
140     col = KEYROW(row)
150     IF col > 0 THEN EXIT loop
160   END FOR row
170 END REPEAT loop
180 RETURN LOG10(col)/LOG10(2)*8+row
190 END DEFINE keytest
```

KEYROW has disadvantages of its own. To begin, it requires two parameters to describe a particular key, which can make it difficult to use in user-defined functions, which can return only one value. It takes eight calls of the command, one for each row of the matrix, to read the whole keyboard. The keyboard is read instantaneously with no pause facility. Some combinations of keypresses produce unusual misreadings which can make the keyword unreliable, especially in games which involve a number of keypresses. Finally, the KEYROW values relate directly neither to the positions of the keys on the keyboard nor to their ASCII values. In short, KEYROW can cause more problems than it solves. For a full description of this unusual command, see Keyword of the Month.

One way to improve KEYROW in some applications is to eliminate the use of both row and column readings

program until a key is pressed. Listing one achieves both improvements. It is designed for use in programs which require the detection of single keypresses only.

The output of the routine is a single integer value between 0 and 63. The numerate will quickly protest that there are 65 keys on a QL keyboard but the wise

Listing 2.

```
200 DEFINE PROCEDURE keyhelp
210 LOCAL loop,key
220 REPEAT loop
230   key = keytest
240   AT#0,0,0:PRINT#0,key,
250   IF key = 25:PAUSE 30:EXIT loop
260 END REPEAT loop
270 END DEFINE keyhelp
```

will point out that the two SHIFT keys return identical values and so they are considered to be one key.

The routine enters a loop from which it escapes only when a key has been pressed. Within the loop is another loop controlled by a FOR...NEXT statement

written for clarity of presentation rather than for efficiency. A marginal increase in the speed with which the keyboard is read can be obtained by combining lines 130 to 150 on one logical line and deleting line 160. A further speed increase results from replacing LOG10(2), a constant,

KEYWORD OF THE MONTH

The KEYROW command is exceptional to SuperBasic and is designed to poll the keyboard very quickly. Basics more commonly use INKEY\$ to read the keyboard but in SuperBasic the INKEY\$ command is slowed by deliberately-imposed delays controlled by system variables and by the need to translate keypresses into ASCII values.

KEYROW is very similar to the IN function which can be used to read the Sinclair Spectrum keyboard. For the purposes of the KEYROW command the 65 keys on the QL keyboard are arranged in an eight by eight matrix — the two SHIFT keys return the same value. Unlike the logical arrangement of the IN values on the Spectrum keyboard, the KEYROW matrix has no obvious connection between the position of the keys on the keyboard and their position in the matrix.

The syntax of

KEYROW requires that the programmer declares a matrix row in brackets after the keyword, a value between zero and seven. The function returns a value of zero if no key on that row is pressed or a value of two raised by an exponent between zero and seven to represent a pressed key.

If more than one key in the row is pressed simultaneously the values are added. That is a simple binary system. If, for example, the five function keys are pressed together KEYROW (0) will return the binary value 00111011, 59 in decimal, each 1 representing the position of a pressed key in the matrix.

Although the overall distribution of the keys in the matrix might by patternless, there are three special groups of keys. The first group is the function keys, grouped in row 0. The second group is the cursor keys with SPACE in row 1. As the Sinclair joystick ports mimic the function keys — CTL 2 — and the cursor keys and SPACE —

CTL 1 — it might have been sensible if the KEYROW columns for the various joystick movements were identical but they are not.

The final group of keys are the SHIFT, CTRL and ALT keys in row 7; they do not have ASCII values, are trapped for special purposes by Qdos and do not interact predictably with other keys in the matrix. It is worth noting that somewhere in the translation of KEYROW values into ASCII values the SHIFT/SPACE combination was overlooked and has no effect. In Psion programs, however, the combination

Listing 4.

```
100 DEFine PROCedure
    WAIT
110 LOCal dummy
120 dummy=KEYROW(0)
130 PAUSE
140 END DEFine WAIT
```

prints a space correctly.

An unusual feature of KEYROW is that if a rectangle is drawn anywhere on the matrix and three of the keys at the corners of the

rectangle are pressed, the returned value indicates that the fourth key has also been pressed. This could be an important point when planning games programs which involve simultaneous keypresses. If you are sufficiently dextrous to be able to press all the keys in a row simultaneously the returned value is zero. Incidentally, never press the CTRL, ALT and 7 keys together as they force a system hang-up.

Another use of KEYROW is to clear the input buffer before using a PAUSE, INPUT or INKEY\$ command. The QL has a very effective type-ahead buffer which stores keypresses until they are read. That can be a problem if, for instance, an input string is filled unexpectedly with extraneous keypresses as the contents of the buffer are pushed into it. Difficulties can also occur if a PAUSE is terminated by a stored but unwanted keypress.

Listing four is a procedure called WAIT which overcomes this disadvantage.

with its real value. Those slight improvements would not be detected in most applications.

It would have been possible to have written this routine as a procedure rather than as a function. Some experts believe it is a matter of good programming technique that functions should usually be used to alter variable values and that procedures should never alter variable values. This would be a good rule if Basics, including SuperBasic, kept to it. Notable exceptions include LET, INPUT and READ, all of them procedures, which represent the three methods of assigning a

value to a variable.

In my view, the most important considerations in program writing are efficiency followed by readability. The debate

about whether to use a function or a procedure is therefore of little consequence to the ordinary programmer. For the sake of readability as

well as convention it is probably easier for this routine to be a function.

The second routine is a programmer's aid to the *keytest* output. Rather than look up *keytest* values in a table, the programmer can enter *keyhelp* and then press any key to see its *keytest* value. This listing is of value if it is re-numbered with very high line numbers and then merged with the programs being developed. To call the routine, enter its name as a direct command. To leave the routine, press ESC.

The third listing demonstrates how *keytest*

Values for <i>keytest</i> function							
Key	Val	Key	Val	Key	Val	Key	Val
A	36	Q	30	left	9	1	28
B	34	R	37	right	33	2	14
C	26	S	27	up	17	3	12
D	52	T	54	down	57	4	48
E	38	U	62	SPACE	49	5	16
F	35	V	39	SHIFT	7	6	22
G	51	W	13	CTRL	15	7	56
H	20	X	31	ENTER	1	8	6
I	21	Y	53	CAPS	11	9	5
J	60	Z	10	TAB	29	0	46
K	19	F1	8	ALT	23	<	63
L	4	F2	24	/	41	>	18
M	50	F3	32	[3	?	47
N	55	F4	0]	2	—	45
O	61	F5	40	;	59	=	43
P	44	ESC	25	,	58	£	42



can be used in a more general application. It is another development aid which can be merged with other programs. It plots the pixel co-ordinates of a moving point on the screen. The point is moved using the cursor keys, a readout of its current co-ordinates is printed in the command window if ENTER is

pressed, a permanent point is left by pressing F1 and the routine is left if ESC is pressed. Although it is fairly slow, the routine using an INKEY\$ command is some three times slower. It is worth noting how the routine was made crash-proof by the use of logical expressions in the SElect construct.

Listing 3.

```
300 DEFine PROCedure place
310 LOCAL xpos, ypos, key, loop
320 WINDOW 512,256,0,0: OVER -1
330 xpos = 32: ypos = 16
340 REPEAT loop
350   BLOCK 2, 1, xpos, ypos, 7
360   key = keytest
370   BLOCK 2, 1, xpos, ypos, 7
380   SElect ON key
390     = 8: BLOCK 2, 1, xpos, ypos, 7
400     = 9: xpos = xpos - 2*(xpos>1)
410     = 33: xpos = xpos + 2*(xpos<512)
420     = 17: ypos = ypos - (ypos>0)
430     = 57: ypos = ypos + (ypos<255)
440     = 25: EXIT loop
450     = 1: AT#0,0,0: PRINT#0, xpos,ypos,
460   END SElect
462 AT#0,0,0: PRINT#0, xpos,ypos,
470 END REPEAT loop
480 OVER 0: WINDOW 448,200,32,16
490 END DEFine place
```

Values for SuperBasic keyrow function

Key	Row	Col	Key	Row	Col	Key	Row	Col
A	4	16	V	7	16	—	5	32
B	2	16	W	5	2	=	3	32
C	2	8	X	7	8	£	2	32
D	4	64	Y	5	64	/	1	32
E	6	16	Z	2	2	[3	1
F	3	16	1	4	8]	2	1
G	3	64	2	6	2	;	3	128
H	4	4	3	4	2	'	2	128
I	5	4	4	0	64	<	7	128
J	4	128	5	0	4	>	2	4
K	3	4	6	6	4	?	7	32
L	4	1	7	0	128	up	1	4
M	2	64	8	6	1	down	1	128
N	7	64	9	5	1	left	1	2
O	6	32	0	6	32	right	1	16
P	4	32	ESC	1	8	F1	0	2
Q	6	8	TAB	5	8	F2	0	8
R	5	16	ALT	7	4	F3	0	16
S	3	8	CAPS	3	2	F4	0	1
T	6	64	SPACE	1	64	F5	0	32
U	6	128	ENTER	1	1	SHIFT	7	1
			CTRL	7	2			

Finally, the table show the KEYROW and *keytest* values of the QL keys. The table for KEYROW is included because it is easier to use than the matrix layout in the User Guide — consider it a gift. Note that the *keytest* values share with the

KEYROW values a complete absence of recognisable pattern. Having said that, I expect next month's letters column to be full of complicated and arcane explanations for the arrangement of the KEYROW values.

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TROUBLE

Most of the software and hardware available for the QL is sold by mail order. What do you do if it does not turn up, or, when it does it is faulty?

Bryan Davies is Sinclair QL Worlds Trouble Shooter. He is not there purely to have a go at dealers, but if you have a problem and cannot get it sorted out he may be able to help. This month, to kick off, he asks why a bit more thought is not put into products before they reach the shelves.

If you want Bryan Davies to contact a dealer on your behalf write to:
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A significant proportion of QL users read this magazine. It is hoped that some QL hardware and software suppliers read it, too, because this is directed

hardware or software and, full of enthusiasm, installed it, only to find that the system then does not work properly. Problems range from the simple, such as a connector which will not fit or stay in a socket, to



primarily at them. There are competitive reasons for the designers of software and hardware not pooling their ideas but it might not be unreasonable to ask that they co-ordinate their activities to some extent.

Most users will have bought a piece of

the more complex. In the latter category are some programs which cause lock-ups and crashes. The effect may take a long time to surface.

I have such a program, which seemed to work properly after the disc was replaced but is now giving trouble 12 months

later. After spending two years' effort and expense on it, my system now works well but I would still spend more time and money if someone offered a means of combining all the good features I have seen into one all-singing-and-dancing package, with all features mutually compatible.

Time limited

When a product is reviewed, the time available for checking it is limited and important points can be missed and errors made. That makes it all the more desirable that software and hardware producers try to build-in a high level of compatibility to their products. The user should not be left to find all the bugs and conflicts. In the January issue of *QL World* there was a review of multi-tasking software, which gave much-needed information on the current state in this important area. Two of the programs mentioned caused problems with a well-established program, *Key Define*. To be fair to the software writers concerned, they

attempted to overcome the problems and may have succeeded by the time this article appears, but why not check new programs alongside existing, popular ones before releasing them?

The difficulty for the user is that each of the programs mentioned

SHOOTERS



becomes indispensable once one has used it for a time — you cannot give any of them up, but you cannot use them to complement each other. The interaction may be just a nuisance, with a few extra keypresses being needed to get rid of one of the called functions, but it may lead to lock-up or crashing, with the attendant loss of data and time.

There are many such stories, some of which may be the outcome of user finger trouble; others keep circulating after the problems have been fixed. The message is there for the suppliers; there are many unhappy users who will not be in such a hurry to buy their products in future.

To some extent, keeping down the price of software to no more than about £25 encourages many people to buy programs they do not need, the loss not being too great if the purchase proves to be unusable. What if it cost much more than that? Recently I tried two programs, none with hardware included, which cost £60 and £90, and could not get either to work properly. I could not even get started with the one, because the protection device worked too well; even with the key I could not get past first base. The other failed because a cartridge would not read or copy and there were faults in the hardware — and in a replacement.

Conflicts

Although software difficulties may be more common, there is no shortage of hardware faults or conflicts. The memory in my PCML 256K interface cannot now be used with a standard QL, because of a modification made when the MP 256K internal memory expansion was

TROUBLE SHOOTERS

fitted. The ICE ROM fits some QLs but not others; for my QL, it is necessary to file the connector slot to get in the ROM. The ROM connector with the Giga Desk mouse is so loose it falls out without provocation. Simple spring clips on the connector cured that but one connector I checked had a bridge of surplus copper between two contacts and it was scarcely surprising that the QL speaker screamed in pain when the system was switched on. It is to the credit of the QL that it still works after such treatment.

Is your mouse rather sluggish these days? Apart from the possibility of the mouse needing attention, it may be that there is a conflict between the mouse program and another one. Why do suppliers not advise on the problem in their instructions? The desk space required to move the ICE pointer across the screen is influenced by the pointer speed setting, variable via the Custom option, but I found that by accident. Pointer movement is also affected by the SuperBasic line `<Open #4,ser2>`, for reasons I do not understand; the main thing to a user is that putting in this statement reduces the distance the mouse has to be moved and that has to be good.

The two Giga Mice I have used varied by a factor of about five to one in the distance required for a given operation and the best of the two was

poor. The sensitivity required of the mouse for a graphics program is much greater than for a desk-top, so why not provide a gear-change feature? That is, allow the pointer to move much further for a given mouse movement when the desk-top is being used; the limitation on minimum pointer movement would have to be the spacing of icons, such as the text icons down the left side of the Icicle window.

Of mice and men

While talking about mice, is there any merit to introducing their use into programs other than the desk-top type? Not long ago, I read an article in a business computer magazine detailing the advantages gained from using a mouse, rather than cursor keys, with word processing programs. If something could be done with the mouse to improve the abysmal speed of Quill on certain operations — e.g.,



backspacing, copying, erasing — many users would be happy to pay for it.

Presumably, Sinclair had specific uses in mind for the various I/O ports on the QL but suppliers are not united in their approach to using them. Any frequently-used program should be on firmware, usually EPROM, rather than having to be fed in regularly from cartridge or disc, and the rear ROM port is convenient for this, but what does the user do if his/her Toolkit and Desktop need this same port? I understand an adapter may be offered shortly. Why is the Microdrive port at the right not used? One possible use suggested by a *Quanta* reader for Giga Desk owners, is to take the DC voltage feed for the mouse from the Microdrive port, instead of the ROM one, but this means obtaining a suitable connector and PCB and fitting a 5V regulator to the latter.

Competing

The early essays into providing multi-outlet units for the QL appear to have come to little. We still have to face up to the fact that joysticks, mouse, desk-top, toolkit, modem, memory and disc interface may be competing for the same sockets.

Mention of 5V raises a problem which must have plagued most users of interfaces, although some may not yet have realised just what has been causing their agonised moments. The available 5V capacity in the QL is not sufficient if certain interfaces are fitted, with the result that the voltage can fall far enough below 5V to cause the QL processor to cry enough and lock-up.



TROUBLE SHOOTERS

Interfaces should either be low enough in consumption not to cause the voltage to drop that far, or a separate supply should be provided, as is done with disc drives.

If there is any subject to rival lock-ups it must be Quill. Those who went through the distressful period of Version 1 Psion packages and unreliable Microdrives will be much happier with Version 2.00 or later — make sure you get 2.35, though, because some switching programs work much better with that. Even so, one becomes irritated with certain Quill features as they stand and the temptation to hope for something better cannot be resisted. The answer might be to buy Editor but it requires much more study than the average program to get the best from it. It may be the most versatile and considered program yet written for the QL and it can be recommended for many reasons, but changing one's approach from Quill to Editor is not easy.

Unrealistic

It may be unrealistic to expect anyone to improve Quill but some of its weaknesses might be dealt with externally. One poor feature, which I have used very little until recently, is the Import operation. One can now work with Editor and Quill and transfer files between the two, but transfer to Quill involves Import, with its attendant changes to the structure of the incoming file, and Editor displays non-printing codes, making text awkward to work

with. A combination of the best features of Quill and Editor would seem worth marketing, especially if it were usable for the QLT and Thor upgrades.

The letters published in *QL World* and the *Quanta* group magazine show that users have certain common problems. The obvious one is printing. Requests for help with printer drivers outnumber any other category. Connected with this subject are regular pleas for better print spoolers or, more usefully for Quill users, a way of printing in the background from the existing Quill print facility, without having to make a special `_lis` file for spooling.

Different codes

Different printers require different input codes to produce the same functions; additionally, there are variations in the number of functions available from printers. Even with the 10 Translate options of later Quill versions, it is not possible to call all required printer functions. The correct key inputs to use when calling printer functions could be a subject for endless discussion and it may be pointless asking for standardisation of the codes used, but one thing is certain — the keypresses required, and the crib sheet you have to keep handy, make selecting printer functions rather a pain.

Would it not be pleasant if the existing Quill Typeface feature were extended to offer more choices? Such as `-F4+N` for NLQ print, `F4+C` for condensed print, `F4+E` for enlarged print. One snag is that you would have no indication, other than on the status line, of what typeface is current. What about more character

fonts to show the additional typefaces?

There appears to be some activity in the field of replacing the Quill fonts by others but not adding others to them. Referring again to interaction between programs, printing can become very slow when a new program is installed and it is most unlikely that the instructions with the program will acknowledge that, let alone offer any solution. One recurrent problem with my system is that certain combinations of program cause the printer to stop for about a second at the end of each line, reducing the effective speed by about 50 percent.

An old QL hand has just written to me and said he found the instructions with one package to be so detailed as to prevent him getting started using the program. Why were the instructions not aimed at getting the new user going, with the detail in a reference section at the end? The Digital Precision approach of giving comprehensive documentation to cover the needs of an experienced programmer meets with my approval but, as I am not a programmer, I would appreciate being led by the hand rather more.

No competitor

The other end of the scale has the small set of badly-spelt instruction, which leave you almost completely on your own.

Quill is a program which has only the one competitor. *Qspell* has none and it has served me well for more than a year. The advertisements say "thousands sold", so why has no competitor appeared? The program is not expensive and the only reason I would like to see a competitor is that *Qspell* has one serious

disadvantage for my work and I cannot persuade anyone to overcome it.

Artificial intelligence is a popular phrase but I think this program possesses a particularly wicked form of it. How else can one regard something which takes two words — "sexism" and "sexing" — and invents one of its own — "sexisming". If that were the only instance, there would be little cause to complain; unfortunately, there have been several hundred such instances.

Copy protection

This is another program where the copy protection causes difficulties for the user. Apart from not being able to make full back-up copies, the method used to run the program makes it impossible to multi-task it with its obvious companion, Quill. That is a problem shared with other stand-alone programs, such as Editor — which is Supercharged SuperBasic — and Impacct — run-time Archive; both have defeated my efforts to add them to switching routines. They can, however, be exec-ed separately, alongside switching routines, at the expense of having to do more keying than I feel should be necessary.

Criticism is my natural bent and I should make it clear that most of the hardware and software I have bought for the QL has done a good job, taken overall. The system is wonderful now, compared to the skeleton it was at first, but how much better it would have been not to have had to sweat so much blood fixing what were, in effect, faults. If it is any encouragement, I have not had to have as many replacements for add-ons as I did for the QL — six.

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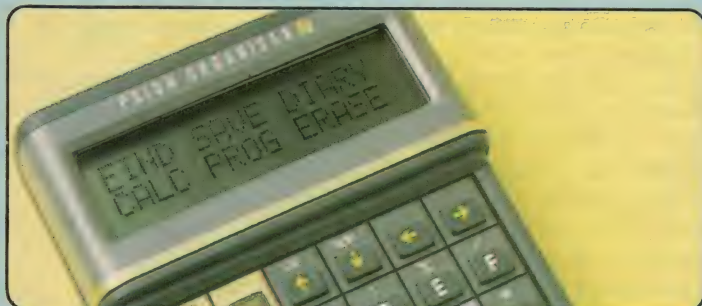
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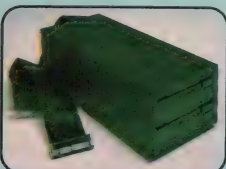
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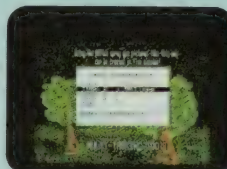


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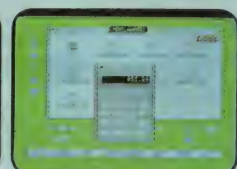
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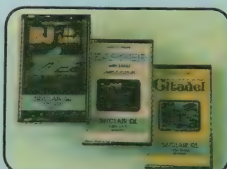
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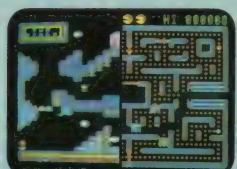
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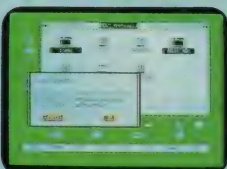
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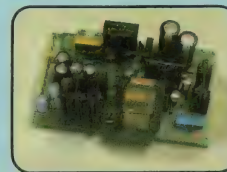
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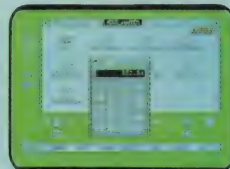
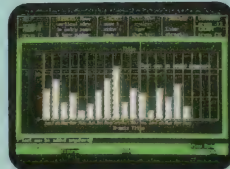
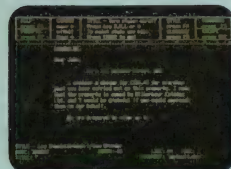


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commands including cell protection and titles command. In Archive the USR function allows you to link in machine code routines, and the SEDIT command offers improved screen designing. Easel includes the famous 3D bar graphs to give your presentations that professional polish.

THOR PC SYSTEM SOFTWARE

Included with the Thor is an improved version of the ICE computer front end, that allows simple housekeeping to be achieved by the use of mouse or cursor. Built in screen dumps by QDUMP DANISOFT allow you to snapshot the screen at any time to the printer or a file. A much enhanced operating system gives you menu control, single key task switching between Xchange and other tasks (including Superbasic) and extended windowing capabilities.

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UTILITY FILE

Ron Massey reviews a superfast Quill, extensive Archive application and an interesting bag of tricks from Pyramide. He also has the latest utilities news.

QLTurboQuill Athene Consultants £15

Serious QL users tend to swear by Quill or swear at Quill — on occasion, both. One of the most common complaints is the noticeable lack of speed of the graphics-type cursor. From Athena Consultants, *QLTurboQuill* is unusual in that it is a program which is not used as an addition to Quill; rather it re-configures Quill so that a more efficient cursor system is used, thereby improving screen-handling speed by better than 10 percent overall.

When you have the revised version of Quill running, the most notable evidence of an alteration is that the text cursor appears as a pair of horizontal lines, one above the cursor position and the other beneath it, rather than the conventional block cursor. The current line position on the ruler is indicated by a line cursor rather than the conventional dot.

While reducing the area of the cursor can do little but increase the potential speed of its movement, other more subtle changes

have been made during the re-configuration.

Block copy and delete is considerably faster and, if a program like *Keydefine* is used to enter text to a Quill page, a tremendous increase in the rate of character input is readily evident.

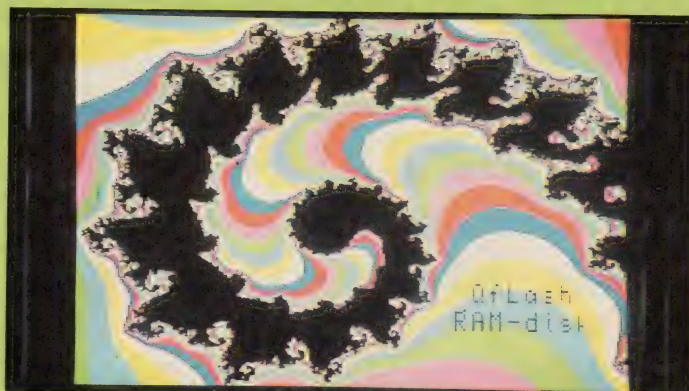
Improving Quill performance has a small price. First, once modified, CONFIG_BAS will not work; one or more working versions of Quill, perhaps each with different printer drivers, must include the correct printer driver and file defaults before modification. Second, *QLTurboQuill* is Quill-version-dependent, so be sure to order the correct version of *QLTurboQuill* for your version of Quill.

If you take word-processing seriously, *QLTurboQuill* is essential. A genuinely useful program, the increase in handling speed is truly phenomenal.

RAMdrive
CST
£15 EPROM
£10 disc
QFlash
£19

This month marks the appearance of two high-speed RAM discs, both supplied as upgrades — v4.00 of the now well-known *QFlash* RAM disc and toolkit and the latest CST upgrade for its dynamic RAM disc,

obtaining the greatest benefit from RAM discs requires that their use be applied in a systematic way. Remembering to save the contents of a RAM disc to a less ephemeral medium before switching off your QL, to



Benchtest demonstration.

RAMdrive.

Formatting these RAM discs is optional, depending how you need to apply memory management. CST and *QFlash* both recommend that the RAM discs be formatted to a sector count whenever they are to be used with programs which would otherwise

mention just one of the more obvious examples, is a good idea.

One area where a RAM disc comes into its own with a tremendous increase in speed is where it is used with databases. A datafile is copied to RAM disc from whence a program, such as *Archive*, processes it. When

Benchmark 2.

Program	Recol+save time (7-32K files)	Load/display time (per 7,000- 32K files)	Time per file (per screen frame)
QFlash v4.00	18.91	647	0.092 (10.82 fps)
CST			
RAMdrive	18.19	718	0.103 (9.75 fps)

claim all unattached memory, such as is the case with Quill.

RAMdrive is now an integral part of the CST Thor and has been made available for the QL as an upgrade either on EPROM or on disc or Microdrive. *QFlash* RAM disc and toolkit is also available on EPROM or magnetic media.

Like any program,

completed, the file is then copied back to a medium, under a temporary file name, and tested for corruption.

In that way you will always have the most recent copy of your valuable database still intact, should any corruption occur, as happens occasionally.

Benchtest comparisons provide a reasonably good

Benchmark 1.

Program	Draw/save time (14-32K files)	Load/display time (per 7,000- 32K files)	Time per file (per screen frame)
Toolkit RAM			
disc	*125	121 (per 100)	1.214 (0.08 fps)
QFlash v4.00	119	861	0.123 (8.13 fps)
CST			
RAMdrive	119	861	0.128 (7.81 fps)

*Standard RAM disc on the Sandy Super Q Board v1.17.

Archivist Ark Distribution £29.95

Bridging the gap between the flexible but difficult Archive language, a fourth application of the Psion Archive Run Time Module using the ARK management shell has been released by ARK Distribution.

Archivist incorporates a number of exceptional features enabling you to customise your Archive applications for particular requirements. What is even more important is that you are now able to convert existing records for use in a developing filing system.

Each of the 22 screen fields per record on an 80-character by 25-line screen display can be re-named, allowing *Archivist* to be used for such diverse applications as mailing systems,

household records, stamp collections, library data or a detailed photograph index.

System commands controlling the operation of *Archivist* are entered by single keypresses. Incorporating a new SuperBasic extension it is also possible to configure your program to call for program or data information from either mdv or flp.

In addition to records being viewed, the *Archivist* screen information includes system prompts relevant to the command level you are in, a status line indicating the file name, remaining memory, current record number and record count.

Mentioning a few of the command options available to the *Archivist* system, included is a file back-up utility with optional over-write, change file contents,

obtain a directory — with file lengths — merge two files, locate text in the order field, list a range of fields to a printer, read any field to the screen and browse through 20 records at a time, select a sub-file on up to five fields at once or on a numeric range and an extensive range of file management commands.

Continuing what appears to have become standard company policy, the 10,000 word A4 *Archivist* manual, following from those for the more specialist *Cardfile*, *Mailfile* and *Library File* systems also produced by ARK, is clear, concise and logically laid out. Written in a style which users can regard as sequential information levels, you can quickly find as much or as little program information as you require.

Designed principally for flexibility, *Archivist* fills a niche not addressed previously by other similar systems. *Archivist* has been designed to run on a standard 128K QL and, while disc drives are preferable, they are not essential. Extensive use of machine code has been made, where speed is an important consideration.

While printing may be done from within the *Archivist* system, using the ARK *Mailmerge* program available for £9.95, it is possible to use the information from an *Archivist* export file and a Quill _lis file to produce formatted reports to your design.

With appeal to a wide range of users, *Archivist* files originated on the QL can be transferred to industry-standard business machines such as the IBM and compatibles and the ICL OPD. Extremely good value, *Archivist* is a powerful database tool which is both easy to use and very flexible.

Bag of Tricks: Volumes 1 and 2 Pyramide £12

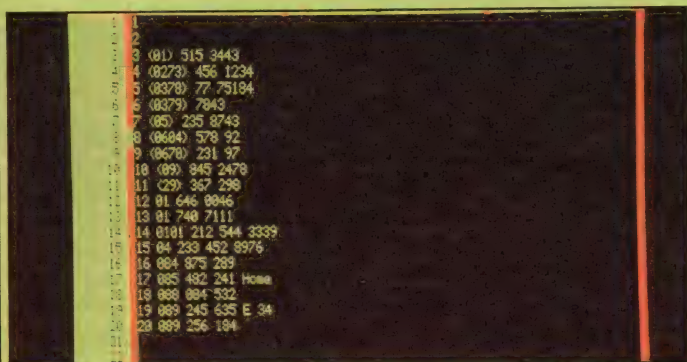
Another first from the French software house Pyramide is the first two of what is hoped will be a series of cartridges containing what, for lack of a better description, can be described as a pot pourri of information.

Bag of Tricks is a kind of newsletter, combined with programming tips and advice. In addition, a number of games and utilities have been included, the latter of which you can use in your programs.

The Quill file _doc contains information regarding BT. Opening with "Welcome to the BAG of TRICKS", the commentary provides an introduction to the concept of BT. An index of each cartridge is included in the _doc, as are details regarding applications of the tips, programs and routines.

Included in the first volume are previously-undocumented PEEKs, POKEs and useful keyboard controls. Several machine code utilities, such as PAINT — better than SuperBasic FILL — a function to obtain available free memory and a break-inhibit have been written by Mick Andon. A useful screen compressor by Fran Moerel has also been included in the repertoire.

You can use the BT character set to give your screen a new look or you can play Alex Gassman's mini *Pacman*. This version, written entirely in Basic, is similar to the classic original but does not include the use of sprites. The game,



The Archivist Screen.

approximation of the performance of a program and, in this, RAMdrive and QFlash are indeed impressive. The benchmarks are, unless otherwise specified, in seconds.

Regarding the benchmarks, it should be borne in mind that the figures stated are influenced by a number of factors, the most important of which is the exact configuration of a particular QL.

Also affecting benchmark testing is the number of various operations the test

program has to perform in addition to its primary function.

On the surface, it would appear there is little to choose between either the CST or QFlash programs. The apparently logical conclusion is that choosing either high-speed RAM disc is very much swings and roundabouts.

If there is any single feature which may decide which is the better of the RAM discs from your point of view, it must be whether you wish to have a speed bias towards LOAD-ing time or SAVE-ing time.

however, requires fast reflexes and is equally demanding.

Volume two of BT continues where edition one left off. New tips, games and utilities make

Other volume two items include some of the features found in the *Pyramide Graphic Toolkit* such as XPIXS, XCHRS, and YPIXP window functions and a decimal/

given medium.

A novel concept, future editions of *Bag of Tricks* are expected to appear as often as sufficient numbers of useful submissions by outside contributors to *Pyramide* are made to make new releases feasible.

All QL enthusiasts are encouraged to send their programs, information and comments either directly to *Pyramide* or to Rio Promotions. Submissions should be on a Microdrive cartridge for consideration for future editions.

No restrictions have been placed on the theme for submissions but, as a general guide, small programs or ways of solving difficult mathematical problems are better than large, complex program structures.

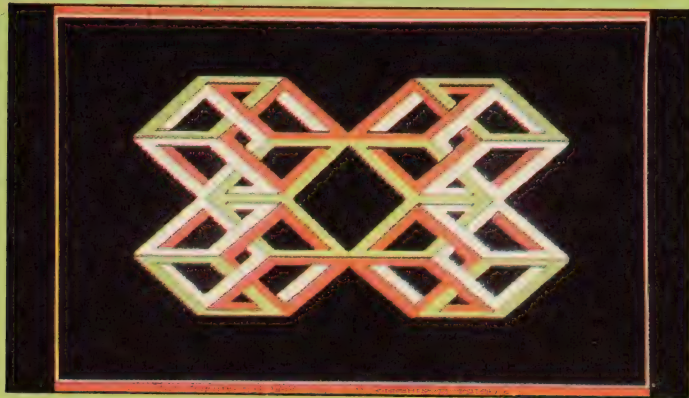
Quoting from the first edition of *Bag of Tricks*: "We are mainly interested in SuperBasic programs and small routines in machine code which may add a Basic keyword or other utilities

of this nature, graphic screens drawn by *QL Peintre* or other similar programs.

"We are specially interested in receiving hints and tricks for the QL or its peripherals. If your program needs instructions, we suggest that you provide the information in a Quill file."

Information

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One of the more picturesque tricks.

using the QL somewhat simpler and more entertaining.

New games such as *Snake Byte* and *Moulin*, or utilities such as *Quick cloning*, enabling you to make fast back-up copies with a single loading of the master, and *File Length*, a function enabling you to find the size in bytes of a file saved on Microdrive or disc have been included in volume two of BT.

hexadecimal numeral conversion function.

A solution for the problem of error-checking for the availability of files and drives has been provided in a toolkit routine including *CATALOGUE*, for checking the availability of media; *FILE*, for checking if a file is present on the named device; and *PLACE*, which returns the number of sectors not used on the

Care Electronics is now bundling the latest version of the *Liberation Software compiler Qliberator* and either the re-configurable or EPROM versions of *Toolkit II* for £74. This unprecedented offer will give users the best of both worlds with the *Toolkit II* extensive range of commands and the increased speed of compiled program operation.

Tony Tebby's complete 2.08 *Toolkit II* has been added to the *Sandy Super Q Board* on a 64K EPROM, so users now have the option of having the complete range of *Toolkit* commands by first inputting *tk2_ext*, either as a discrete command or by adding the command to individual *BOOT* programs. If the *Toolkit* is

UTILITY FILE EXTRA

More news of what is happening on the utilities front.

not initiated with the command, it remains, for the most part, switched off.

Whether the TK is initiated or not, you will have its <ALT> <ENTER> to get back the last line typed-in. I wonder what other commands remain always on-line?

Two of the principal advantages of the new system are its memory-saving capability for use with programs which are

not *Toolkit*-compatible and that the new system leaves the ROM port vacant for other applications.

Just past the drawing board stage, *QFlash* has produced its prototype *Chip Board* on which you can have up to four 32K EPROMs. The board, with its through-connector, is inserted between a disc drive I/F and the QL expansion port.

The prototype was

supplied with EPROMs for the *Qjump QMON*, the *GST Assembler*, the *QFlash RAM disc* and *Super Toolkit II*. Initiating the EPROMs is done by typing-in an appropriate keyword.

Adding about 70mm. to the overall width of the QL, the disc I/F, unfortunately, extended rather precariously past the case of the QL. Once into production, however, an I/F housing extension should correct any potential problems.

If you are not using a disc I/F and/or have extra RAM fitted internally, you have the option of having 256K of EPROM by connecting two *Chip Boards* in series. That is equivalent to having eight standard EPROMs plugged into the back of the QL, each individually addressable.

QL VOICE AND SOUND

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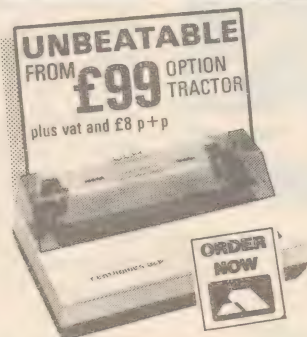
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MASTER



elcome to a new regular QL World

feature, DIY Toolkit. Many readers like to see useful utilities and commands and though SuperBasic is an excellent implementation of the language, it still has its failings. The prolific number of toolkits and SuperBasic extensions prove how popular the demand must be.

We intend to include at least one useful machine code utility or command every month. In all cases, they will be presented as SuperBasic extensions, so that you can include them in your programs. Each extension will be described in detail, with an assembly language listing, so that you can customise them to your requirements. For those without an assembler, we will be including a SuperBasic hexadecimal loader program. Finally, every month we will include a short demonstration to show exactly how the extension works.

Sound facilities

This month, we look at the QL sound facilities. They are only marginally better than the Spectrum two-parameter BEEP command. Interesting sounds can be obtained from the more complex QL BEEP command, either through careful manipulation or random trial and error. Nevertheless, the simple ability to play tunes easily is lacking.

We will try to alleviate the problem with two sound commands, Tune and Speed.

The Speed command is to change the tempo of our melodies and we will not be dealing with it in too much detail. Suffice it to say that Speed takes a single integer parameter.

It will be used in the delay loop for note duration, which will be explained later. Therefore the larger the number the slower the tune.

The tune command takes a single string for its argument. The string contains the data for the duration and pitches of the notes to be played, in sequence. They are still all in the form:

"pd"

where 'p' is the pitch and 'd' is the duration. In

allows two octaves range of pitches. The notes are represented by:

'A' to 'G' - Lower octave

'a' to 'g' - Upper octave

Any of these can be made sharp. In a musical score, sharps are considered in terms of the key signature of the tune. Therefore it is possible to sharpen a note twice, once in the signature and again during the score. So if the tune was signaturred in the key of G-Major, it would include one sharp

asking you to sharpen the note with respect to the key signature indicating, in this case, the note 'G'. Similarly, 'B-sharp' would be the note 'C'.

Complex

If that all sounds complex, do not worry. For the purposes of the program, sharps are considered to be the black keys on a standard musical keyboard. Signatures do not apply, so notes may not be doubly sharpened. Also, since there are no sharpened — black — keys for the notes 'B' or 'E', it is assumed that they cannot be sharpened. Any attempt to do so will be ignored by the program.

The second character in the note pair refers to the duration of the note and must be an integer in the range '1' to '9'. The digit '0' can be used, but will have the effect of playing the note for a very long time, unless the Speed command has been given a ridiculously low number. While that note is being played, the system will "hang".

When deciding duration, the higher the number the longer the note. The increases are linear so '2' will make the note twice as long as '1', and so on. By sending different numbers to the Speed command, there is effectively a limitless range of durations possible.

Tune procedure

The assembly language, shown in figure one, can be split into a number of distinct parts. The first few lines use the BP.INIT vector to include the two new procedures in SuperBasic. It is a fairly common piece of code and all the future routines will start in the same way.

Second is the Tune procedure. Initially it uses

DIY TOOLKIT



Each month Marcus Jeffery will show you how to add an extra command to SuperBasic, until you have a complete toolkit. Superbasic listings are provided. We start by enhancing the QL Sound capability.

addition, the pair of characters may be preceded by the hash symbol '#', if the sharp of the note is required. Flats are not included and must be written as the sharp of the next lower pitch. The command

— that of F. When playing the tune, any 'F' notes on the stave should be played as F-Sharp, unless otherwise indicated. Therefore if you were to find a sharpened 'F' note during the piece, it would be

Figure 1.

LOC	OBJECT	STMT	SOURCE STATEMENT	0104' 4E75	105	RTS	successful end of string
		1 *			106 *		
		2 *	This will include the procedures TUNE and SPEED.		107 *	This is the note delay factor. Increasing this value will	
		3 *			108 *	slow the speed of the tune.	
		4 *	The command for tune will be of the form:	0106' =0002	109 *		
		5 *	TUNE 'string'		110 DELAY	DS.W 1	
		6 *	where the string argument will represent the duration and pitches		111 *		
		7 *	of the notes in the tune to be played.		112 *	This is the sound parameter block, for use by the IPC command trap	
		8 *		0108' 0A	113 *		
		9 *	The command for SPEED will be of the form:	0109' 0B	114 SOUND	DC.B \$0A	The IPC command number
		10 *	SPEED integer	010A' 0000 AAAA	115	DC.B \$0B	The number of parameters
		11 *	where the number represents a delay factor for the duration of notes.	010E' 0000	116	DC.L \$0000AAAA	The 'amounts' of each parameter
		12 *		0110' 0000	117	DC.B \$00,\$00	Pitch_1, Pitch_2
		13 *	First add the procedures	0112' 0000	118	DC.W \$0000	Interval between steps
		14 *		0114' 00	119	DC.W \$0000	Duration
0000' 3078 0110		15	MOVE.W \$110,A0	0115' 00	120	DC.B \$00	Step in pitch / Wrap
0004' 43FA 0006		16	LEA.L PROC,A1	0116' 01	121	DC.B \$00	Randomness / Fuzziness
0008' 4E90		17	JSR (A0)		122	DC.B \$01	No reply parameters
000A' 4E75		18	RTS		123 *		
000C' 0002		19 PROC	DC.W 2		124 *	This is the Kill Sound parameter block	
000E' 0016		20	DC.W TUNE=*	0117' 0B	125 *		
0010' 04		21	DC.B 4	0118' 00	126 ESOUND	DC.B \$0B	The IPC command number
0011' 5455 4E45		22	DC.B 'TUNE'	0119' 01	127	DC.B \$00	No parameters
0016' 008C		23	DC.W SPEED=*		128	DC.B \$01	No reply parameters
0018' 05		24	DC.B 5		129 *		
0019' 5350 4545 44		25	DC.B 'SPEED'		130 *	This is a table of pitch values for the two octaves,	
001E' 0000		26	DC.W 0		131 *	labelled 'A' to 'G' and 'a' to 'g'. Any of these	
0020' 0000		27	DC.W 0		132 *	characters may be preceded by '#' in the string, in	
0022' 0000		28	DC.W 0		133 *	which case the sharp of the note is considered. If the	
		29 *			134 *	note does not have a sharp, then it is ignored; hence	
		30 *	This is the TUNE procedure		135 *	some duplication of values.	
		31 *		011A' 2C29 2727 2422	136 *		
0024' 3078 0116		32 TUNE	MOVE.W \$116,A0	0120' 1F1D 1B1B 1917 1514	137 PITCHES	DC.B 44,41,39,37,36,34	A,AA,B,B,C,CC
0028' 4E90		33	JSR (A0)	0128' 121Q 0F0F 0E0C	138	DC.B 31,29,27,27,25,23,21,20	D,DD,E,E,F,FF,G,GG
002A' 6600 00A4		34	BNE EEXIT	012E' 0B0A 0909 0807 0605	139	DC.B 18,16,15,15,14,12	a,AA,B,B,C,CC
002E' 3636 9800		35	MOVE.W 0(A6,A1.L),D3		140	DC.B 11,10,9,9,8,7,6,5	D,DD,E,E,F,FF,G,GG
0032' 6700 009A		36	BEQ TEXTIT		141		
0036' 5489		37	ADDQ.L #2,A1		142	END	
0038' 41FA 00E0		38	LEA.L PITCHES,A0				
003C' 4204		39 NOTES	CLR.B D4				
003E' 47FA 00C8		40	LEA.L SOUND,A3				
0042' 6100 00A8		41	BSR GETCHAR				
0046' 6600 0086		42	BNE TEXTIT				
004A' 0C01 0023		43	CMPI.B #'B',D1				
004E' 6600 000C		44	BNE NOSHARP				
0052' 7801		45	MOVEQ #1,D4				
0054' 6100 0096		46	BSR GETCHAR				
0058' 6600 0074		47	BNE TEXTIT				
005C' 0401 0041		48 NOSHARP	SUB1.B #'A',D1				
0060' 0C01 0006		49	CMPI.B #6,D1				
0064' 6F00 0006		50	BLE LOWER				
0068' 0401 0019		51	SUB1.B #25,D1				
006C' E309		52 LOWER	LSL.B #1,D1				
006E' 8204		53	ADD.B D4,D1				
0070' 203C FFFF FFF1		54	MOVE.L #15,D0				
0076' 0C01 001B		55	CMPI.B #27,D1				
007A' 6A00 0054		56	BPL EEXIT				
007E' 1770 1000 0006		57	MOVE.B 0(A0,D1.W),6(A3)				
0084' 6100 0066		58	BSR GETCHAR				
0088' 6600 0044		59	BNE TEXTIT				
008C' 0401 0031		60	SUB1.B #'1',D1				
0090' 203C FFFF FFF1		61	MOVE.L #15,D0				
0096' 0C01 0008		62	CMPI.B #8,D1				
009A' 6A00 0034		63	BPL EEXIT				
009E' 48E7 4000		64	MOVEQ #1,D1				
00A2' 7011		65	MOVEQ #11,D0				
00A4' 4E41		66	TRAP #1				
00A6' 4CDF 0002		67	MOVEQ #1,D1				
00AA' 45FA 005A		68	LEA.L DELAY,A2				
00AE' 343C 0032		69 DELAY1	MOVE.W #50,D2				
00B2' 3B2A 0000		70 DELAY2	MOVE.W 0(A2),D4				
00B6' 51CC FFFE		71 DELAY4	DBF D4,DELAY4				
00BA' 51CA FFF6		72	DBF D2,DELAY2				
00BE' 51C9 FFE6		73	DBF D1,DELAY1				
00C2' 47FA 0053		74	LEA.L ESOUND,A3				
00C6' 7011		75	MOVEQ #11,D0				
00C8' 4E41		76	TRAP #1				
00CA' 6000 FF70		77	BRA NOTES				
00CE' 4280		78 TEXTIT	CLR.L D0				
00D0' 4E75		79 EEXIT	RTS				
		80 *					
		81 *	This is the SPEED procedure				
		82 *					
00D2' 3078 0112		83 SPEED	MOVE.W \$112,A0				
00D6' 4E90		84	JSR (A0)				
00D8' 6600 FFF6		85	BNE EEXIT				
00DC' 3236 9800		86	MOVE.W 0(A6,A1.L),D1				
00E0' 41FA 0024		87	LEA.L DELAY,A0				
00E4' 3141 0000		88	MOVE.W D1,0(A0)				
00E8' 4280		89	CLR.L D0				
00EA' 4E75		90	RTS				
		91 *					
		92 *	Procedure to obtain a character from the string parameter, and place				
		93 *	this in register D1. Reduce the number of remaining characters				
		94 *	from D3, and return D0 with any errors				
		95 *					
00EC' 0C43 0000		96 GETCHAR	CMPI.W #0,D3				
00F0' 6700 0010		97	BEQ DATAEND				
00F4' 4241		98	CLR.W D1				
00F6' 1236 9800		99	MOVE.B 0(A6,A1.L),D1				
00FA' 5289		100	ADDQ.L #1,A1				
00FC' 5343		101	SUBQ.W #1,D3				
00FE' 4280		102	CLR.L D0				
0100' 4E75		103	RTS				
0102' 70FF		104 DATAEND	MOVEQ #1,D0				

the CA.GTSTR trap to fetch the string parameter and place it on the arithmetic stack. No check is made on the number of parameters and any further strings will be ignored. That means that you could include comments as part of the command, in the form:

TUNE "c1E2G4 ... C8",
The chorus start here!"

Conversion

After setting the starts for a couple of tables, the routine loops through the note pairs — the loop start at label NOTES, through to the BRA NOTES command. After checking for and flagging a sharp — '#' symbol — the routine converts the pitch letter into a number between '0' and '27', where the even values represent the two octaves of notes and the odd values represent the same notes sharpened. The appropriate pitch for the note is then taken from the table 'PITCHES' and placed into the Pitch£1 parameter of the 'SOUND' block.

Next, the duration is retrieved from the string and the note is started by

the MT.IPCOM trap which uses the SOUND block to send a message to the 8049 processor which handles the sound.

You may have noticed, when using the BEEP command, that sending a second note directly after a long first note will truncate the original sound, rather than waiting for its duration to finish. The same thing happens with the machine code version, only much faster. That usually results in you hearing only the last note of the string. To avoid the problem, the code features an internal delay loop. It implies that the machine will effectively "hang" while playing a tune but it ensures correct durations.

That may not always be suitable if, say, you wanted to play a tune while printing or obtaining keyboard input, and so on. The only other way to deal with this problem is to set up the Tune command as a multi-tasking job. That would have to poll the 8049 processor continually to see



DIY TOOLKIT



whether the sound was still being produced; a command, IPC 1;bit1, will give this information and only process the next note when the previous one has finished.

Simple process

Figure two gives the entire code in the form of a SuperBasic hex loader. We will be using this same loader each month, so making a copy of it will save you some typing. The program will load the machine code into memory, keeping count of the byte values. They are then checked against the final 'Checksum' figure — make sure you type this correctly — before saving the program to the device and filename you specify.

Once saved, it is a simple matter to include the extensions in the SuperBasic syntax for your use. To do so, you will need to type the following:

```
a=respr(350)
lbytes
mdvl tune data,a
call a
```

You can either type this in direct command mode or include the lines as part of a SuperBasic BOOT file, to execute on system start-up. Once that is done, the commands will be installed. You can easily check this by typing:

```
100 speed 3000
200 tune "C1E1G1c3"
which should produce the
commands in upper-case
when listed. You can then
```

Figure 2.

```
100 REMark : Sinclair QL World
110 REMark : ** HEX LOADER **
120 :
130 CLS
140 RESTORE
150 READ space
160 start = RESPR(space)
170 PRINT"Loading Hex...":hex_load start
180 INPUT"Save to file...":f$
190 SAVE f$
200 STOP
210 :
220 :
230 DEFINE PROCEDURE hex_load(start)
240 :
250   DEFINE FUNCTION decimal(x)
260   RETURN CODE(h$(x))-48-7*(h$(x)>"9")
270   END DEFINE decimal
280 :
290 byte = 0 : checksum = 0
300 READ h$ : IF h$="*" THEN GO TO 460
310 IF LEN(h$)<>2*INT(LEN(h$)/2) THEN
320   PRINT"Odd number of hex digits in: ";h$
330   STOP
340 END IF
350 FOR b=1 TO LEN(h$) STEP 2
360   hb=decimal(b):lb=decimal(b+1)
370   IF hb<0 OR hb>15 OR lb<0 OR lb>15 THEN
380     PRINT"illegal hex digit in: ";h$
390     STOP
400   END IF
410   POKE start+byte,16*hb+lb
420   checksum=checksum+16*hb+lb
430   byte=byte+1
440 END FOR b
450 GO TO 300
460 READ check
470 IF check<>checksum THEN
480   PRINT"Checksum incorrect. Recheck data."
490   STOP
500 ELSE
510   PRINT"Checksum is correct."
520   PRINT"Data entered at: ";start
530 END IF
540 END DEFINE hex_load
550 REMark : Space requirements for the machine code
560 DATA 350
570 REMark : Machine code data
580 DATA "3078011043FA0006","4E904E7500020016","0454554E450000BC05"
590 DATA "5350454544000000000000","307801164E90660000A4"
600 DATA "363698006700009A","548941FA00E04204","47FA00C8610000A8"
610 DATA "660000860C010023","6600000C7801","6100009666000074"
620 DATA "040100410C010006","6F00000604010019","E309D204203CFFFFFFF1"
630 DATA "0C01001B6A000054","177010000006","6100006666000044"
640 DATA "04010031203CFFFFFFF1","0C0100086A000034","48E7400070114E41"
650 DATA "4CDF000245FA005A","343C0032382A0000","51CCFFFE51CAFFF6"
660 DATA "51C9FFEE47FA0053","70114E416000FF70","42804E7530780112"
670 DATA "4E906600FF632369800","41FA002431410000","42804E75"
680 DATA "0C43000067000010","4241123698005289","534342804E7570FF4E75"
690 DATA "00000A080000AAAA00000000000000000000010B0001"
```

Figure 3.

```
100 REMark : TUNE and SPEED demonstration program
110 :
120 SPEED 1500
130 :
135 RESTORE
140 REPEAT play
150   READ tune$
160   IF tune$ = "*" THEN EXIT play
170   TUNE tune$
180 END REPEAT play
190 :
200 DATA "C1F4C1a1G1F1D7"
210 DATA "G1G2F1E1F1E1D1C1A4"
220 DATA "A1#A1B1"
230 DATA "C1F4C1a1G1F1D7"
240 DATA "G1G2F1E1C2G1F7"
250 DATA "*"
```

try running this to ensure that everything is working correctly; you should get a C-Major scale.

We have included a slightly more complex demonstration program in figure three. It plays a just-about-recognisable tune which has special relevance to this month's Puzzle Page.

Extensions

The extensions we have included this month are by no means original but should be generally useful to many.

The articles are designed for you. Rather than let us decide what routines we believe you want, why not write and tell us which routines you would like to be featured?

Larger utilities, such as a complete set of sprite manipulation commands, are too long for inclusion. Slightly longer routines than the one presented this month could be included.

THE QL IS FASTER AND MORE POWERFUL THAN YOU HAVE BEEN LED TO BELIEVE...

Have you ever wondered why while the QL's specification looked so good, you have been so disappointed by slow, boring & pedantic software, others may tell you that the QL's a slow machine: **DON'T BELIEVE IT! Only DIGITAL PRECISION SOFTWARE reveals the true, hidden power of the QL.**

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★ **TURBO** is the fastest basic compiler for the QL, faster even than SUPERCHARGE and much, much faster than the Pseudo-Compiler: it is compatible with the entire syntax of SuperBASIC. TURBO has ALL THE FEATURES of award winning compiler SUPERCHARGE, and many more besides. It supports instant linking (with pipes, shared procedures & functions and full read AND write access to variables in other tasks); it is much friendlier than SUPERCHARGE (an autocorrector routine is built to correct most wrongly written programs) and far less strict; it has no limits on size of output code, it supports virtual arrays, full WHEN ERROR trapping (on ALL QL versions) & rubber arrays; allows the passing

parameters both by reference and by value; it has a full configurator permitting compiler directives, defaults on screen help, resident compilation (you can even run other tasks as you compile!), switchable local optimisation, it has implicit datatypes INTEGER FOR loops at last, & INTEGER/STRING SELECT the list is virtually endless. TURBO TOOLKIT (see below) is included in the price, as is a 350 A4 page **TURBO ENCYCLOPEDIA** (the only reference book you will need). There's no LENSLOK and no royalties. TURBO's multitasking code is more compact than that of SUPERCHARGE, and is up to six times faster than SUPERCHARGE code!! TURBO costs **£99.95** complete.

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★ **EYE — Q V2.0** complete with comprehensive A4 manual the definitive QL graphics/CAD package — this is the one with all the features. Amazing smoothness, incredible power. Costs just **£29.95**, or **£34.95** for a version to work with the GIGA MOUSE system.

★ **THE EDITOR** is the one program EVERY QL owner needs. The definitive text and word processor system, typically 10-20 times faster for some applications (full benchmarks available). Editor has about a hundred commands & is amazingly flexible — totally command file driveable! You can even handle direct machine code (not just assembly listings!) — yes, you can use THE EDITOR to edit THE EDITOR! If you are developing programs (including SuperBASIC ones), writing documents or just using your QL a lot, THE EDITOR is absolutely invaluable. The system is supplied at **£29.95** with a detailed 80 page A4 manual. If you have an expanded QL, **£39.95** buys you the "SPECIAL EDITION" of EDITOR with even more speed, power and commands. This is a superb product — eat your heart out, IBM/APPLE/APRICOT/DEC/AMIGA/ST users, you can't have it!

★ **BETTER BASIC** is an expert system to improve your BASIC programs (autocorrection of all correctable faults, highlighting of all others). Very few people have mastered SuperBASIC (the bad QL User Guide has a lot to answer for) — everyone else needs BETTERBASIC. This configurable utility cleans up code, annotating as it goes along. Its provisional name was DOMESTOS — it kills bugs, dead!! Cost — just **£24.95** complete with lucid A4 manual.

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DIGITAL PRECISION

Hands-On

KEYBOARDS

The first computer/user interface with which everyone becomes most familiar is the keyboard. From almost everyone's point of view

and for a number of reasons, it is one of the most important input devices with which you will be associated. Also, because of tactile associations, the keyboard is a very personal thing.

It is surprising that the QL has had the tremendous degree of acceptance it has. So far as I am concerned, the QL keyboard, although reasonably functional, leaves much to be desired. With continuous heavy usage, key-switch posts tend to bind — a nuisance for touch typing — and the flat layout of the keycaps never seems to satisfy the differences of finger length. Having said that, one becomes conditioned to accepting the inevitable.

What is more surprising is that it has taken peripheral manufacturers so long

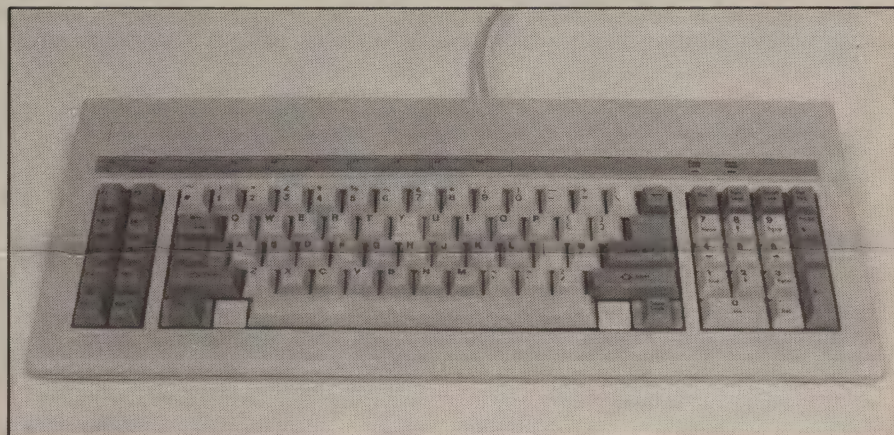
to realise that there is a ready market for a new keyboard. Even more surprising, at this late date not one but several alternative keyboard systems have either become available or are in the pipeline and either augment or replace the existing QL keyboard assembly.

The first working keyboard alternative for the QL, the Schon is supplied as a kit consisting of a new switch assembly, keycaps, replacement QL top and new LED indicators.

Except for a change of colour and shape of the keycaps, the modified QL appears very little different in appear-

developed the habit of letting their fingers pause with the keys in a state of semi-depression before going to the next character. With some QLs, that may manifest itself initially by inputting several unwanted characters in rapid succession.

The QL's character input rate is governed by two timing controls and users can rectify most character repetition problems to some extent by POKEing new values to the key timing addresses. Character delay (between successive key presses) defaults to 30 and is accessed by POKE_W 163980,n.



ABC. Taking a different approach.

ance from the original: the new keycap livery includes red function, grey alpha character, space bar and cursor, and black numeric and control key caps.

Supplied as a DIY kit, installing the Schon is simple and the instructions accompanying the units are well-presented. Altogether, there are two ribbon cables, a group of six discrete wires and eight screws involved in the change-over.

Removing eight screws around the perimeter of the QL and lifting off the original top provides access to the internal connections. Propping open the top, so that it is at right angles to the QL, the two ribbon main cables are teased out of their main PCB sockets.

Using pliers, the black socket-lock for the six discrete wires is teased up, lifting by about 3mm., making no attempt to remove the lock from the PCB. Once that is accomplished, the six wires for the power, mdv1_ and mdv2_ LED indicators are lifted out.

Using the Schon is a delight. The feel of the keyboard very closely approximates to that of one of the better typewriters and is very positive in keying action. Only when the Schon was used for the first time did I fully appreciate just how much adaptation I had made to compensate for the deficiencies of the original keyboard.

Comparatively, typing on the Schon is fast and positive. It may require some re-orientation for those who have

Character repeat frequency, defaulting to 2, is accessed by POKE_W 163982, n. "n" is a numerical value.

Rainbow Keyboard

The Rainbow key caps and vacuum-moulded case in QL black is a remote keyboard, available as a DIY project. Adapting your QL consists of installing the coiled wander lead adaptor through either an existing unused aperture in the QL case or cutting a small slot for the cable.

Simple internal modification is made by removing the top of the QL, teasing the original membrane ribbon cables out of their PCB sockets; it is a good idea to tape the free ends of the old ribbon cables to the aluminium plate — and installing the new cable adaptor, trailing the cable either through an existing unused aperture in the QL case or cutting a small slot wide enough for the cable. In all, that takes about 10 minutes.

Once the top is replaced, the Rainbow keyboard is connected to your modified QL by the wander lead plug. Although it is just about possible to have both the original keyboard ribbon cable and the adaptor ribbon cable in the same socket, this course is not recommended. The PCB connectors are single-sided and attempting the insertion of both cables may succeed only in providing poor or no contact for either keyboard.

The Rainbow keys are laid out in four groups; the function keys, the alphanumeric keys — in the QL format — are grouped centre-left; a group of four additional cursor keys between an additional numeric keypad, on the right. The key groups are live at all times and do not require a shift lock to activate individual key clusters.

The keyboard supplied for this report produced no evidence of key-bounce — a common problem when mechanical components are interfaced to high-speed electronic circuits, causing input of unwanted multiple characters.

ABC Elektronic

At the top end of the price range and taking a different configuration approach, the ABC keyboard, sold in the U.K. by Digital Precision, is identical in appearance to the Thor and IBM PC-XT keyboards. It is as long and a little wider than the QL and is connected by a coiled wander lead, terminated in a 5-pin DIN plug.

Since the keyboard supplied by Digital Precision for this report did not include a QL interface — it would appear that ABC Elektronic has been slow in supplying units to the U.K. — the only impressions which can be reported are the appearance of the keyboard and using it with the Thor.

Using the ABC keyboard is what typing is all about. The smoothly operating keys are placed in three groups: 10 function keys on the left side of the board, a central panel of 56 character and control keys and a panel of 18 number and additional control keys on the right. Two LEDs above the number key panel indicate CAPS lock and NUMBER lock — the latter shows whether or not the NUMBER key panel is engaged.

Key caps are positioned at different row heights, putting them within natural finger-reach. Traditionally, the number five key also includes a raised dot for finger positioning by touch.

Some of the ABC keys are coded internally to serve multiple functions, most of which correspond directly to two or more key combinations on the standard QL. The <F6> through <F10> function keys produce the same response as <SHIFT> and <F1> through <F5>, respectively, on the QL. Backspace — upper right corner of the character panel — is analogous to the QL <CTRL><LEFT> cursor (delete character) keys.

ABC QL interface, as viewed at the December Microfair, consists of a small PCB, on the bottom of which is an IC plug. Installing the I/F consists of

removing the 8049 co-processor — which handles the QL I/O and BEEP functions — and installing the I/F PCB in its place.

While simple to do, installation requires a certain amount of finesse. The centipede-like 8049 needs to be teased out of its socket; the I/F needs to be teased back into it. Brute force applied for either operation will result in bent or broken pins.

Ultrasoft

The Ultrasoft keyboard, imported by D. S. Enterprises, is a complete membrane replacement in the form of a PCB on which are mounted a set of push-button switches.

The Ultrasoft system supplied for this report is an early development prototype, illustrating the direction the company design considerations are going. The keyboard switches are unusual in that they have a click-type action, with a movement of about 1mm., giving key-presses a firm and positive feel. Also, should any switch require replacement, they are available as inexpensive spares and individual switches

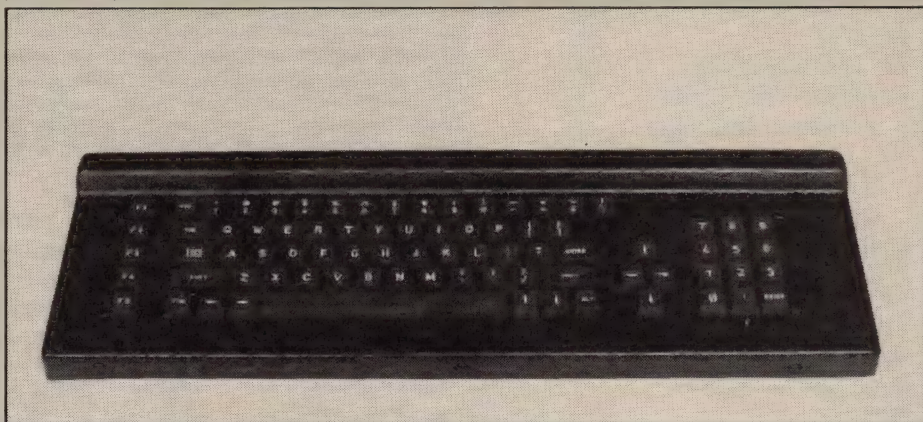
with use and are often the cause of mdv problems.

Also, clean the Microdrive heads with a damp cotton swab dipped in isopropyl alcohol. If you have a degausser, it is also a good idea to apply it liberally to the heads.

Deciding which keyboard will best suit your requirements will be a matter of personal preference, available working space and price range. The Schön and Ultrasoft systems are compact, at the lower end of the price range, and occupy the same desk area as the standard QL.

As add-ons, the Rainbow and ABC keyboards, with additional key groups, provide a greater typing facility than is possible within the area confined to the QL top, require a larger desk space, have a feel of excitingly smooth operation with a promise of durability at an additional cost of about the price of a box of discs.

Overall, if you have used the native keyboard for any length of time, you will have become accustomed to its various quirks and responses. All of the new keyboards will require a certain amount of re-orientation. This



Rainbow. Excitingly smooth.

may be unsoldered, removed from the PCB and replaced by new switches.

Installation is achieved by removing the top of the QL, extracting the two ribbon cables from the main PCB and unscrewing the aluminium plate on the underside of the lid. The entire original assembly is then removed.

The replacement PCB is then positioned on the underside of the QL top. Carefully align the PCB switch tops with the original key assembly and replace the screws. Test the action of all of the keys prior to final re-assembly, to make sure that each key clicks home. When replacing the top, be sure that the ribbon cables are gently positioned over the mother-board.

Whichever system you choose, once you have removed the case it is a good idea to give the QL a simple general service; push the rubber drive wheels for the Microdrives down firmly on to their shafts — they tend to ride up

means that some adaptation will have to be made to the difference in the feel of the keying to suit your own particular typing style.

Product: The Schon Keyboard
Price £54.95

Source: Schon Keyboards, 15 Northcote Crescent, West Horsley, Surrey KT24 6LX. Tel: 04865 3836

Product: The Rainbow Keyboard
Price: £80.45

Source: Rainbow Digital Repairs, Clark House, Haxby, York YO3 8HU. Tel: 0904 768853

Product: The ABC Keyboard
Price: £99.95

Source: Digital Precision, 222 The Avenue, London E4 9SE. Tel: 01-527 5493

Product: D.S. Enterprises keyboard
Price: £59.95

Source: D.S. Enterprises, 25 Trinity Rise, London SW2 2QP. Tel: 01-671 0209

PUZZLE PAGE

Marcus Jeffery invites you to help decipher some top secret military information.

We have a very serious puzzle this

month, based on advanced techniques being tried in top-secret military research plants.

RULES

All entries must be written on the panel provided on this page. Any other form of entry will be disqualified.

Entries must be sent by post to:

PUZZLE PAGE, Sinclair QL World, 79-80 Petty France, London SW1H 9ED to arrive no later than Friday March 6, 1987.

The winner will be the first correct entry drawn from the editor's tin hat.

All entries will be judged by the Editor of *Sinclair QL World* whose decision is final. No correspondence will be entered into regarding the result.

Entry form

PROBLEM ONE:

Weight #1 =

Weight #2 =

Number of minutes =

PROBLEM TWO:

Minimised probability = ..

%Number of minutes = ...

Name

Address

.....

.....

To get into the correct mood for the puzzle, and consequently stand a better chance of winning, you must first have some medals. A few coins tied to pieces of ribbon should do. Also, do not forget the helmet. Raiding a kitchen bowl will usually suffice. The puzzle is a variation on a very popular competition I ran a few

Mountain and Plain, the total time would be:

$$4 + 5 + 1 = 10 \text{ minutes}$$

The initial Forest cost is not included. To complete its journey, the tank must reach grid position G40, starting at position A40. G40 is known as the target square.

To decide to which

```
! 000000000111111111222222222333333334
! 1234567890123456789012345678901234567890
-----
!
A! PFFFFMMMMFFFWFFFFFFFFFFFMMSSWSSSSPFFFFF
B! PFFFFMMMMFFFWFFFFFFFFFFFMMSSWSSSSPFFFFF
C! PFFFFMMMMFFFWFFFFFFFFFFFMMSSWSSSSPFFFFF
D! PFFFFMMMMFFFWFFFFFFFFFFFMMSSWSSSSPFFFFF
E! PFFFFMMMMFFFWFFFFFFFFFFFMMSSWSSSSPFFFFF
F! PFFFFMMMMFFFWFFFFFFFFFFFMMSSWSSSSPFFFFF
G! PFFFFMMMMFFFWFFFFFFFFFFFMMSSWSSSSPFFFFF
H! PFFFFMMMMFFFWFFFFFFFFFFFMMSSWSSSSPFFFFF
I! PFFFFMMMMFFFWFFFFFFFFFFFMMSSWSSSSPFFFFF
J! PFFFFMMMMFFFWFFFFFFFFFFFMMSSWSSSSPFFFFF
K! PFFFFMMMMFFFWFFFFFFFFFFFMMSSWSSSSPFFFFF
L! PFFFFMMMMFFFWFFFFFFFFFFFMMSSWSSSSPFFFFF
M! PFFFFMMMMFFFWFFFFFFFFFFFMMSSWSSSSPFFFFF
```

Figure 1.

years ago. Of course, I have made this version a little more difficult.

Figure one shows a map of a particular area of terrain in the distance and war-swept country of Lets-Ave-Ago. The Good Guys recently asked for U.K. assistance in their struggle and they were sent the world's first fully-automated tank. The remarkable machine is fully-equipped with laser guiding and artificial intelligence routines to find the best route across hazardous terrain.

The tank can move either horizontally or vertically — not diagonally — across the country and the 'COST' shown in figure two represents the number of minutes it takes the tank to cross each square. Those costs are figured as the tank moves into each square. So if the tank started on Forest, then moved to Water,

square it is moving next, the tank looks and tries the four possible squares from its present square, then considers the four squares from this, then the four squares from this. Those squares are known as S1, S2 and S3 respectively. Thus the tank is effectively looking to three squares ahead. At the full extent of its look-ahead, the tank evaluates an expression and assigns a score to the move. In all, assuming no squares lie off the board, the tank

Figure 2.

LETTER ! TERRAIN-TYPE ! COST ! PROBABILITY

P	! Plain	! 1	! 10%
B	! Bridge	! 1	! 35%
D	! Desert	! 2	! 18%
F	! Forest	! 3	! 4%
W	! Water	! 4	! 7%
M	! Mountain	! 5	! 6%
S	! Swamp	! 6	! 8%

will evaluate $4 \times 4 \times 4$, or 64 positions. Some of them may have the tank going to square S1, then

returning to its start square for S2, then back again to S1. Others may have the tank evaluating the same S3 square but using different S1 and S2 squares to reach the position. The evaluation the tank uses is:

(a) Calculate the distance between square S1(x1,y1) and the target square G40(x0,y0) ...

$$\text{OLD} = \text{SQRT}(\text{ABS}(x1 - x0)^2 + \text{ABS}(y1 - y0)^2)$$

(b) Calculate the distance between square S3(x3,y3) and the target square G40(x0,y0) ...

$$\text{NEW} = \text{SQRT}(\text{ABS}(x3 - x0)^2 + \text{ABS}(y3 - y0)^2)$$

(c) Calculate the total cost of reaching square S3 ...

$$\text{COST} = \text{Cost of entering S1} + \text{Cost of entering S2} + \text{Cost of entering S3}$$

(d) Assign a score to the move ...

$$\text{SCORE} = \text{WEIGHT \# 1} * (\text{OLD} - \text{NEW}) - \text{WEIGHT \# 2} * \text{COST}$$

Having evaluated all the possible look-aheads, the tank chooses the route with the highest score and makes the move to the appropriate square, S1.

The two weight factors, WEIGHT #1 and WEIGHT #2 allow the

distance and movement costs to be assigned different priorities. They may vary in value

between '1' and '20' inclusive.

What I want to know is what are the optimum values of WEIGHT #1 and WEIGHT #2, so that the tank crosses the terrain in the fewest minutes, and how many minutes will it take?

Not satisfied with this little poser, I have another problem. You may have been wondering what the 'Probability' column is in figure two. It represents the probability that the tank will be hit when crossing the specified terrain feature. Note this

is the probability per terrain square, not the probability per minute. So, for the second part of the problem, I would like you to find the route which minimises the probability of the tank being hit — not too easy. Not only will you have to find a fairly quick and direct route but you will also have to make use of cover.

When you have found the answers, fill them in on the entry form — or photocopy. As usual, I will be interested to see any programs to solve either or both problems.

De-Godelizing

I am impressed. Despite the errors which crept into the last puzzle page, the vast majority still managed to find the correct answer. To recap, the problem was to de-Godelize an extremely large number into a unique message. The number contained more than 1,000 digits and was given in the form of a series of mainly six-digit numbers, multiplied, then raised to powers, and divided by another list. Unfortunately, despite efforts to reduce the number of printed digits to avoid errors, two mistakes still managed to make their way through the rigorous quality control procedures. The mistakes were:

6844361 should have read 684361 and
689710 should have read 689701.

Despite those problems, many people managed to decipher the correct seasonal message, which read:

SINCLAIR QL WORLD
WISHES YOU A HAPPY
AND PROSPEROUS
NEW YEAR.

As I hinted in the original problem, there is a correct way and a better way to solve this problem. The proper way

was obviously to expand the number, then divide as often as possible by the sequence of prime numbers until the answer appeared. Most people, however, spotted the better way. All the six-digit numbers given have prime factors. Consequently it is necessary only to work through those, considering the numerators and denominators separately. That will eventually give the correct answer.

I would like to thank you all for the vast number of program listings I received this month. Some of them, written in Pascal, C and even assembly language, were particularly noteworthy. For all you SuperBasic worshippers, the program this month — figure three — is supplied by Derek Lee of South Shields, Tyne & Wear. It is fairly self-explanatory.

Under the circumstances, anybody who had obviously managed to de-Godelize the number was included in the draw, even if they had not found the two errors. The winner this month is A. J. Tainsh, of Stoke-on-Trent, Staffordshire.

```

100 REMark DEGODELIZE
110 REMark BY DEREK LEE
120 MODE 4
130 BAUD 1200
140 OPEN #3:ser1
150 DIM prime(50)
160 DIM nums(37,3)
170 DIM alpha$(26)
180 CLS
190 AT 10,20:PRINT"FILLING ARRAYS PLEASE WAIT"
200 REMark Find first fifty prime numbers
210 prime(1)=2
220 count=2
230 try=2
240 REPEAT find
250   IF count=51 THEN EXIT find
260   get_prim
270 END REPEAT find
280 DEFine PROCedure get_prim
290   FOR loop=2 TO try-1
300     IF try MOD loop=0 THEN EXIT loop
310   NEXT loop
320   prime(count)=try
330   count=count+1
340   END FOR loop
350   try=try+1
360 END DEFine
370 REMark Set up alpha characters in array
380 FOR al=1 TO 26
390   alpha$(al)=CHR$(al+64)
400 NEXT al
410 REMark fill array with data
420 count=0
430 RESTORE
440 REPEAT fil
450   READ times,number
460   FOR loop=1 TO number
470     count=count+1
480     READ nums(count,1)
490     nums(count,2)=times
500   END FOR loop
510   IF count=37 THEN EXIT fil
520 END REPEAT fil
530 REMark find letters and print
540 CLS
550 AT 10,10
560 FOR prim=1 TO 50
570   FOR num=1 TO 37
580     test=1
590     REPEAT try
600       a=nums(num,1)/prime(prim)^test
610       IF INT(a)=a THEN
620         test=test+1
630       ELSE
640         test=test-1
650         nums(num,3)=test*nums(num,2)
660       EXIT try
670     END IF
680   END REPEAT try
690 END FOR num
700 totop=0
710 FOR tot1=1 TO 24
720   totop=totop+nums(tot1,3)
730 END FOR tot1
740 tobot=0
750 FOR tot2=25 TO 37
760   tobot=tobot+nums(tot2,3)
770 END FOR tot2
780 PRINT alpha$(totop-tobot);
790 PRINT #3,alpha$(totop-tobot);
800 END FOR prim
810 PRINT #3
820 STOP
830 DATA 1,5,980869,534131,167727,714502,878758
840 DATA 3,2,919181,594255
850 DATA 5,4,886937,439310,689701,515531
860 DATA 10,1,212055
870 DATA 15,4,496009,728575,467539,470761
880 DATA 15,4,989571,366689,697709,923099
890 DATA 20,4,871844,874394,684361,527711
900 REMark
910 DATA 1,4,552653,727955,683467,630170
920 DATA 1,4,593750,859429,966649,758843
930 DATA 3,1,652740
940 DATA 5,3,983471,678215,172800
950 DATA 2,1,54375
SINCLAIRQLWORLDWISHESYOUAHAPPYANDPROSPEROUSNEWYEAR

```


TECHNICAL HELPLINE

Colin Opie is the Sinclair QL World resident technical expert. If you would like him to answer your problems write to:

Technical Helpline
Sinclair QL World
79-80 Petty France
London SW1H 9ED

Enigmatic error

Having read on page 10 of *QL User*, October, 1985, of the undocumented "WHEN ERROR" construct for error-trapping in SuperBasic, I have tried unsuccessfully to use it on a JS (version 1.10) QL, although the interpreter readily accepts the statement. Could you tell me where I might find more information?

Leon Sienkiewicz

The letter from Sienkiewicz is one of many we have received concerning the additional error-handling commands available in the JS ROM version of SuperBasic. There are also two other commands. MISTake and TRA, which seem to be causing many a sleepless night.

In the JM version ROM there is no real error-handling capability, apart from being told that an error exists. At that point you can type CONTINUE if you want to try to keep going, ignoring for the moment the statement which generated the error. On the other hand, if you are able to edit the offending line, you can do so and then enter RETRY. That will force SuperBasic to re-execute the statement by retrieving what is known as its continuation status, decrementing the statement pointer and performing a CONTINUE.

You cannot

CONTINUE or edit and RETRY if an error was generated by a statement in a direct command line — i.e., a line typed-in from the keyboard containing no line number. The major flaw in this rather simplistic approach to error-handling is that, whenever an error occurs, your program will always stop running. That makes the writing of user-friendly, robust applications programs a little difficult, to say the least.

The more recent JS and MG version ROMs attempted to improve the situation by allowing you to report and recover from program errors, without leaving the program. They tried to do so by providing an additional set of SuperBasic keywords. The problem is that the code for the keywords was never really finished and debugged. The effects observed as a result of this are various, depending on when your

keywords I have taken a generally sound approach to their definition. If your QL operates in a slightly different way, so be it.

The keywords WHEN ERROR and END WHEN can be used to enclose any number of statements to be executed when an error occurs. The SuperBasic interpreter must have seen this static procedure before an error is generated. If you want to make sure you trap all errors, you should place this code at the start of your program. For example:

```
10 WHEN ERROR
   :REMark Report error
   and retry
20 REPORT: GOTO
   ERLIN
30 END WHEN
40:
50< Rest of program >
```

This short error-handling procedure should report the error in channel #0 and allow the program to re-execute the line which invoked the error. That would be of use where multi-

procedure REPORT can take an optional channel argument — e.g., REPORT #n — and will write the appropriate error message for the last error encountered to that channel. Channel #0 will be used if none is specified.

There are 21 system errors Qdos can report. Internally those errors have an error code lying between -1 and -21. The correspondence between error and error code is as shown in the table on the right.

Each of the error names — e.g., ERR_FF, ERR_OV — is available as Boolean functions which will return the value TRUE if that was the last error encountered. An additional function ERNUM will return the internal code for the last error. Those are useful when a different operation is to be carried-out depending on the error. Note the equivalence of the following examples:

```
WHEN ERROR
  IF ERR_EX: PRINT
  'File exists, try again':
  GOTO ERLIN
END WHEN
```

```
WHEN ERROR
  IF ERNUM = -8:
  PRINT 'File exists, try
  again,: GOTO ERLIN
END WHEN
```

Generally it is better programming to use the Boolean functions when checking for a specific error and the error code method when grouping the handling of a number of different errors.

- Checking 'file not found'
340 INPUT'File? ' ;f\$: inf=OPEN_IN(f\$)
- Checking 'file already there'
340 INPUT'File? ' ;f\$: ouf=OPEN_NEW(f\$)
- Checking 'arithmetic overflow'
340 INPUT'Value? ' ;v: x=(hi-lo)/v

Figure 1.

particular machine was manufactured.

It means that you may by all means attempt to use the keywords described but if your machine comes to an irrecoverable halt do not be surprised. In discussing the extra

statement lines requested some kind of input and then operated on that input. See figure one.

The error-handler procedure can do this because of the function ERLIN. It returns the line number where the last error occurred. The

Memory management

I have just installed a Miracle 512K Expanderam on my QL, version AH. When running Psion Chess, I also received an out-of-memory message. Despite being a programming novice I decided to use listing two of the November, 1986 article. I noticed that the listing was for a disc-based system and as I still rely on Microdrives I changed the two flp_ commands to

mdv1_.

When I ran this program as Boot my computer gave an error in expression message for the line `a = ALCHP(75000)`. It also refused to allow me to input `alchp` as higher case. Is this a new Qdos command for disc-based systems and, if so, what do I use instead?

**P. D. Rogan,
Netherton,
Merseyside.**

The Helpline article referred to made many references to the use of RESPR to reserve portions of memory. Unfortunately the two listed programs used the keyword ALCHP. How confusing. Thankfully the solution is simple.

RESPR is the standard keyword to use when allocating memory space

in the QL. It reserves resident procedure memory which, as the November article mentioned, cannot be reclaimed without resetting the QL. ALCHP is a toolkit extension which allows memory space to be reserved but which can also be reclaimed using the toolkit extension command CLCHP.

The reason the memory can be reclaimed in the latter case is because it is what is called common heap memory which is being reserved and not resident procedure memory. Standard SuperBasic has no facility for reserving common heap memory. How does this affect you?

Resident procedure memory is allocated from the top of RAM downwards. Common heap memory is allocated from almost the bottom of RAM upwards. Although either can be used to allocate memory for position-independent code, their effect is not the same when fudging the system memory allocation so as to run absolute code successfully.

You cannot replace the ALCHP commands in the given programs, therefore, with RESPR.

Perhaps the easiest way round the problem if you do not own a toolkit ROM is to reserve resident procedure memory equivalent to the size of your RAM upgrade. If you have a 512K RAM expansion module, reserve 512KB of resident procedure space — e.g., by using the statement `'waste=RESPR(512*1024)`. That will convert your QL to a basic 128K version and you will probably find that your program will then run.

I realise what I have just said may seem drastic but I repeat my point made in the November issue. Software houses which continue to offer programs in absolute code are doing the QL user a great disservice. The sooner they cease to do so the better. That is true in light of front-end multi-task managers now appearing.

Now to the other two statements — MISTake and TRA. The identifier MISTake exists in all the ROMs and is the SuperBasic way of flagging an illegal line read in from a file or

device. When you type-in a line from the keyboard, SuperBasic analyses it to store it in a condensed form. If the line is illegal you will be given the error 'bad line'. The illegal line will not be

stored and you will have to try again.

Let us suppose that you have written your program using a text editor, or that you are transferring a program from another QL via the network ports. You may have made an error when using the text editor, or there may be a transmission error across the network, such that a line has become illegal. SuperBasic will not want to stop the loading process because of the bad line. To circumvent this the keyword MISTake is employed. An illegal line is preceded by this keyword so that SuperBasic will report an error when the program is run and the line executed. Note that you can CONTINUE after such an error because SuperBasic will ignore the remainder of the line, just as with REMark lines.

The procedure TRA is

related to translation tables for printers. The keyword is understood by JS ROMs, though no action will ensue. ROMs for foreign markets — i.e., the MG ROMs — both understand it and act on it. The keyword takes the parameter '0' if no printer code translation is to occur and '1' if a translation table is used.

If you want to perform error-handling on your QL, I would suggest you forget about the effects of SuperBasic and buy a toolkit such as Tebby's Toolkit II from Care Electronics. At least the code there will work as expected and is also a little more versatile. You could concentrate on compiled code using the Digital Precision Turbo compiler. It also allows you to use error-handling routines, though they are not compatible with the Sinclair and Tebby procedures.

Code	Name	Error
-1	ERR_NC	Operation not complete
-2	ERR_NJ	Not a valid job
-3	ERR_OM	Out of memory
-4	ERR_OR	Out of range
-5	ERR_BO	Buffer overflow
-6	ERR_NO	Channel not open
-7	ERR_NF	File, device, variable or procedure not found
-8	ERR_EX	File already exists
-9	ERR_IU	File or device in use
-10	ERR_EF	End of file
-11	ERR_DF	Drive full
-12	ERR_BN	Bad device or procedure name
-13	ERR_TE	Transmission error
-14	ERR_FF	Format failed
-15	ERR_BP	Bad parameter
-16	ERR_FE	File error
-17	ERR_XP	Expression error
-18	ERR_OV	Arithmetic overflow
-19	ERR_NI	Not implemented (yet)
-20	ERR_RO	Read only
-21	ERR_BL	Bad line syntax (SuperBasic)

QL CONNECTIONS

There is more to an interface than a board with a few PIAs on it and some clever programming. In this instalment of QL connections Colin Opie explains the relevance of device drivers.



To use our newly-gained knowledge about the QL expansion port fully and the ways in which the 68008 processor will communicate with devices plugged into it, one more major block of theory needs to be covered. That concerns what are called device drivers. If you have followed everything thus far, you may feel that all we really need to do is design a small board with a few PIAs on it, use direct addressing to program the chips and perform some input and output. To a limited degree you would be correct but let us consider the issues a little more carefully.

The QL operating system Qdos contains a host of I/O procedures and functions which will work on any declared device. If we had a way of telling Qdos that our chip was a device with particular qualities, we could use many of the Qdos system calls immediately to perform our I/O operations. Direct addressing methods would throw

away that ability. Qdos also keeps a record of the absolute position of all control programs relating to declared devices on expansion boards. Hence it does not matter into which motherboard slot we slide a board — see part three in last month's issue.

Once again, direct addressing methods would limit us. We would be forced into using just one board at a time. The proper way to interface new electronics to the QL is to abide by the hardware requirements already dis-

way as for any of its built-in devices, e.g., its serial ports.

We can see this in action by taking a not altogether impertinent example. Suppose a fast 8-bit analogue-to-digital interface is attached to the QL and that its driver software is linked into Qdos with the device name 'FATD'. Once that is done, the device FATD is no different, conceptually, from the built-in device 'SER2'. The following might, therefore, easily be used in an applications program:

```
a) 120 OPEN #5, SER2      b) 120 OPEN #5, FATD
    :                       :
    370 byte$ = INKEY$(#5)  370 byte$ = INKEY$(#5)
    :
```

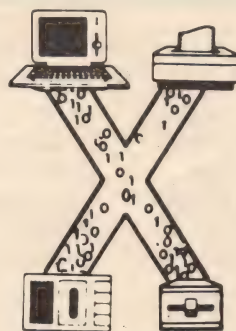
cussed and then write device drivers for each specific board.

Now to the software requirements for interfacing. Much of this will be fairly heavy going but it is essential data to enable the software to be con-

You may notice that, in principle, the ability to extend the number and type of devices known to Qdos is the same as the ability to extend the number and type of procedures and functions known to SuperBasic. You can set up extensions to SuperBasic peculiar to a device interface in the device driver ROM — i.e., alongside the I/O routines required.

Note specially that, once a device driver has been initialised and Qdos knows about it that device may be used either from machine code or from SuperBasic. The choice is yours.

It is common and preferred practice to link device drivers when the QL is switched on or re-set, i.e., booted. The device drivers will be in an area of ROM, situated at the base of a 16-KB block allocated to any one peripheral device — see part one, figure three, December, 1986. Clearly the size of the ROM will depend on the facilities offered. To get Qdos to recognise the existence of such a driver, a standard header is required at the base of the



structed. Later in the series when we start to write the code for specific Qontrol-II boards, you will be able to refer back and gain a more practical knowledge of how to apply this theory.

The QL Qdos kernel can be informed of additional device driver rou-

ROM offset	Size	Use
\$00	Long word	Flag, equal to \$4AFB0001
\$04	word	Pointer to list of SuperBasic extensions
\$06	word	Pointer to driver initialisation routine
\$08	word	ROM identifier string length
\$0A		ROM identifier string (max. 36 characters, ending with LF character).

Figure 1. Standard ROM header.

tines. Qdos will link those into its list of known device drivers. From that point onwards, Qdos will allow the external devices to be allocated channels, perform I/O and so on, in exactly the same

driver code, as shown in figure one.

The two pointers, at offsets \$04 and \$06, must be relative to the base of the ROM. The pointer to the SuperBasic extensions may be zero if no such

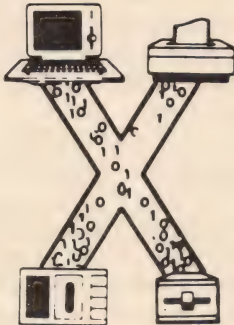
extensions exist. If SuperBasic extensions are supplied, the list of procedures and functions must have the form given in figure two. The number of procedures and/or functions is used to reserve internal table space. If the average length of the names exceeds seven, this number needs to be:

$$(total\ No.\ of\ characters + number\ of\ routines + 7)/8$$

The pointers to the routines must be relative to the address of the corresponding routine pointer. All other rel-

perform a required function. When the QL is re-set, it will link the SuperBasic extensions first and then it will call the device driver initialisation code. The driver initialisation code will be executed in user mode and up to 128 bytes may be used on the stack — register A7. Additionally, the code must preserve register A0 — the initial window ID — and register A3 — the pointer to the ROM — and must not modify register A6. The routine should terminate with RTS. Before going on to look at, say, the

(digital-to-analogue) modules, music and speech processors, and so on. Second, there is the directory type driver definition block. Those drivers, and their definition blocks, are a little more complicated than the simple type because of the additional facilities required, e.g., to permit formatting. They are clearly suited to drivers for floppy



discs, hard discs, silicon-RAM storage modules, controllable micro-cassettes and so on.

Because there are two groups of definitions we will look at them separately. The basic I/O operations differ slightly between the two groups. Keeping the descriptions of the two groups distinct will help to ensure that you use the correct form, depending whether you are creating a simple or directory type device driver.

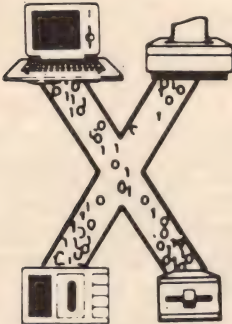
Two definition blocks are required for standard, or simple device drivers. First, there is the device driver definition block. It is, if you like, the static working area for the driver. This block must be set up at the initialisation stage of the device driver. Second, there is the channel definition block. There will be one channel definition block for every channel opened. This block is therefore the dynamic working area for the driver.

Embodied in the standard device

Figure 2. SuperBasic language extension header.

evant details about SuperBasic extensions may be found in the book *QL Assembly Language Programming*, McGraw-Hill (U.K.), 1984. Note that the extensions do not have to relate to new device definitions and the setting-up of channels. There is no reason why an extension SuperBasic function or procedure cannot access the attached hardware directly, provided of course that some form of device base address mechanism has been set up. Some of the Qontrol-II

device driver initialisation code, it is necessary to look first at device driver definition blocks, channel definition blocks and so on. Those blocks are fundamental to the operation of Qdos devices and channels. There are two types, or groups, of device driver definition block. First, there is the standard, or simple, type which defines a non-directory device driver. Those drivers will not support directory, formatting or slaving type operations. They are ideally-suited to direct I/O devices such as serial and parallel ports (analogue-to-digital) and



routines we shall be viewing later show how that can be achieved. You can also add any other useful processing extensions which may suit your new configuration. These are routines which will not access any particular piece of hardware but will nevertheless

Offset (A3)	Use
	Physical layer links
\$00	Link to next external interrupt routine
\$04	Address of external interrupt routine
\$08	Link to next 50/60Hz interrupt routine
\$0C	Address of 50/60Hz interrupt routine
\$10	Link to next scheduler loop routine
\$14	Address of scheduler loop routine
	Access layer links
\$18	Link to access layer of next device driver
\$1C	Address of data I/O routine
\$20	Address of channel open routine
\$24	Address of channel close routine
\$28	Physical driver working space < as required >

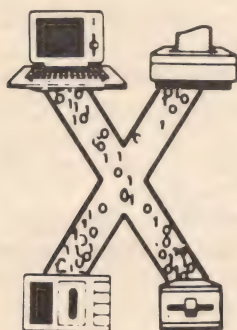
Figure 3. Standard device driver definition block.

CONNECTIONS

driver definition block are the interrupt and service loop physical layer links, the I/O access layer links, and general workspace. The format of the block is shown in figure three.

The physical layer interrupt and service links will be set, if required for the driver, by setting-up the addresses for the driver service routines in question — at offsets \$04, \$0C, and \$14 — and then using the TRAP #1 calls MT.LXINT (D0=\$1A), MT.LPOLL (D0=\$1C, and MT.LSCHED (D0=\$1E) to link the service routines into Qdos. Later we will be discussing these TRAP #1 calls in detail. If any of the service routines are not to be made available to the driver, leave the addresses as zero and do not link them to Qdos.

The access layer links are set up by setting the addresses for the access layer I/O operations — at offsets \$1C, \$20, and \$24 — and then using the



Trap #1 call MT.LIOD — D0=\$20 — to link the device driver definition block into Qdos.

The total size of the definition block is dependent on how much static workspace you decide you want. Notice that the offset in the device driver definition block is shown as indexed by register A3. This is because device driver physical layer code is accessed, by Qdos, with the registers pre-set in fig 5.

Device driver access layer code is entered, by Qdos, with various other registers set, although A3, A6 and A7

standard Qdos channel definition block, re-printed by permission from the book Opie,C: *QL Assembly Language Programming*, McGraw-Hill (U.K.), 1984, (Fig. 6.11). There are two important points about this definition block which must also be applied to any we design. First, there are 24 (\$18)

that it does not require any dynamic channel workspace between access calls, you do not need to reserve any additional bytes for the definition block. If dynamic workspace is required, you will specify how much is needed, by reserving that amount of space on top of the Qdos requirement, and how it is

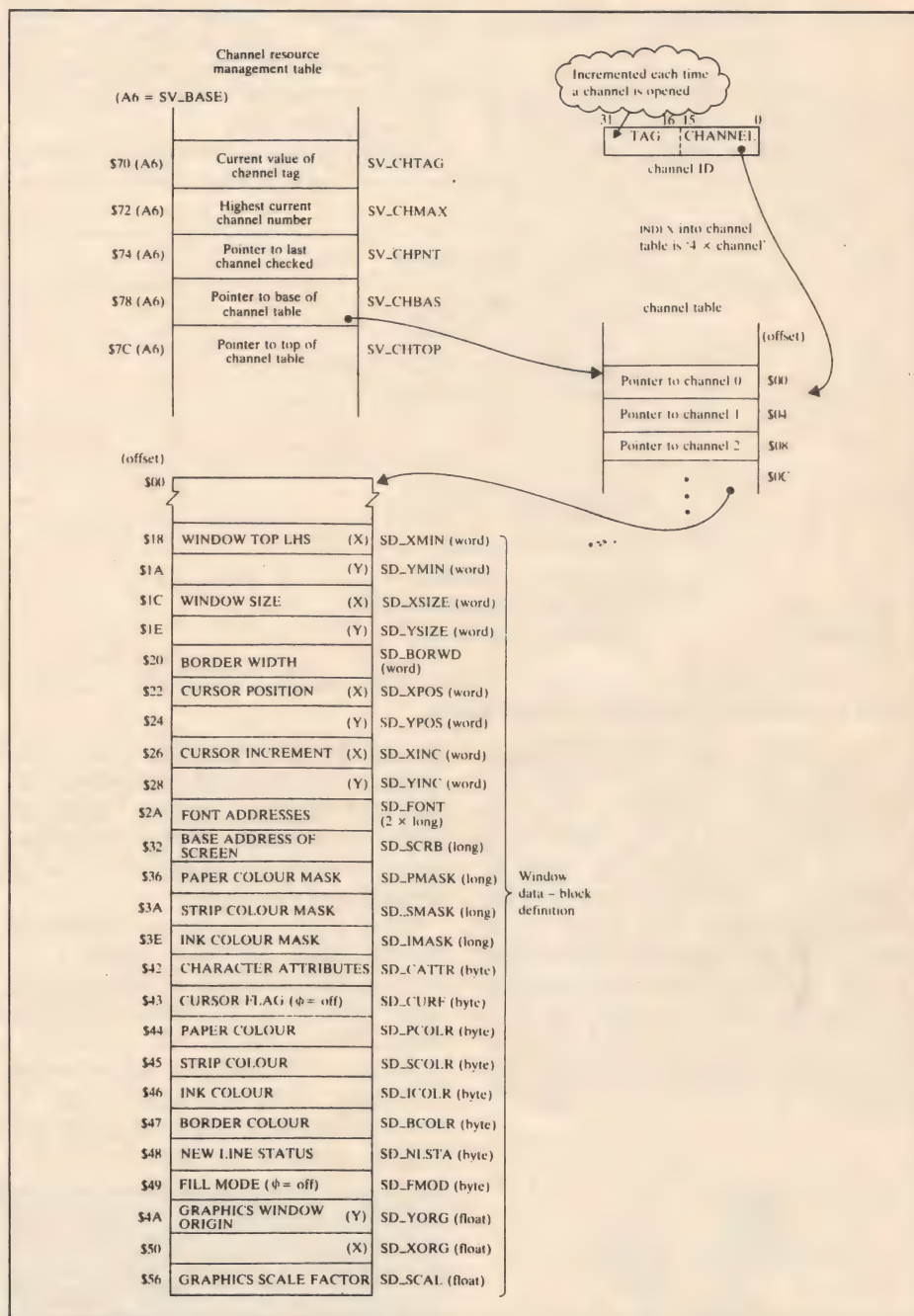


Figure 4. Screen channels and definition block.

Reprinted by courtesy of McGraw-Hill (U.K.)

to be used, by virtue of your code. In other words, apart from the 24 bytes Qdos requires, there are no constraints to the format or size of the rest of the channel definition block.

Remember that a channel definition block must be created for each channel open. It will, therefore, be set up and initialised during an I/O 'open' request.

● Next month we continue by looking at the access layer calls for standard drivers and then progress to directory drivers.

D3	Number of 50/60Hz interrupts since last scheduler call (scheduler loop only).
A3	Pointer to base of driver definition block.
A6	Pointer to system variables.
A7	Supervisor stack, routines may use up to 64 bytes.

will have the same significance as for the physical layer accesses. In all cases, registers A6 and A7 must be preserved.

Figure four shows an example of a

bytes reserved at the base of the channel definition block for use by Qdos. Second, the remaining workspace in the definition block is device-dependent. If your device driver is so simple

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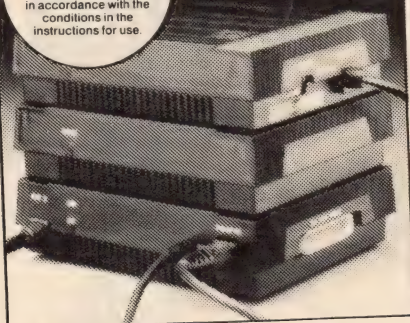
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3D DESIGNER J F Tydeman

3D Designer is a comprehensive program which will allow you to produce screen designs containing 3D graphics with the minimum of fuss and aggravation. As it is quite a substantial program, it will be published in two parts, the second, shorter section will appear in the April issue.

Available commands are displayed together with the current status of the more important ones throughout the program. Commands are accessed by single key entry by pressing the key shown in brackets, usually the first letter of the command name.

Because of the extensive nature of the commands it is not possible to explain all of

them, but the program is quite user-friendly. A few of the more important commands are described below.

Step: Commands which manipulate variable parameters like inks, width, height and depth do so by an increment of nine. That can be changed by pressing any of the number keys.

Graphic commands — width, height, depth and incline:

These commands are used to design a graphic which is then confirmed. The cursor

will change automatically to match the modified design.

Inks: Pressing I displays the default value for the ink colour or the value of the last colour chosen. Pressing the cursor up/down key will alter the value appropriately. Part of the command panel will display the chosen colour. Pressing C for confirm will change the colour. When using 3D graphics you will be asked for a front, side and top colour. Text requires only a front and side colour.

Move, Confirm and Paint: Move enables the current design to be positioned anywhere on the screen by use of the cursor keys. The final position can be confirmed in the usual way with the C key. Paint will draw continuously in the direction of the cursor key pressed.

We will continue explaining the commands and how to use them in the next issue.

```
1 OPEN£2,scr_100x30a0x226
2 PAPER£1,0:PAPER£2,0:PAPER£0,2
3 CSIZE£0,2,0
4 DEFINE PROCEDURE input2
5 CURSE:FILL fil:fcoll:tcoll:scoll:scoll
6 IF b$="v":deviate
7 IF b$=CHR$(27)
8 comma=comma+1
9 IF comma=4:comma=1
10 CLSE£0
11 END IF
12 IF b$=CHR$(232):Files
13 IF hor$="u":zcor=inc/2
14 IF hor$="d":zcor=inc
15 thic
16 angle=(per-co)/ang
17 depth=(hor-ro)/dep
18 col=co+angle:ro1=ro+depth
19 IF hor-ro=0:ro=ro+1
20 IF hor-ro1=0:ro1=ro1+1
21 IF per-co1=0:co1=co1+1
22 IF per-co=0:co=co+1
23 IF co<per AND w>0:w=-w
24 IF co>per AND w<0:w=ABS(w)
25 IF ro<hor AND z>0 AND turnover=0:z=-z
26 IF ro>hor AND z<0:z=ABS(z)
27 IF b$="l":incl=incl-inc:com:bep
28 IF b$="r":incl=incl+inc:com:bep
29 IF b$="s":solid=5-solid:bep
30 IF b$="o":xo=xo-(2*xo):bep
31 OVER xo
32 fi
33 IF b$="i":CLSE£0:col3:tcoll=tcoll:fcoll=fcoll:scoll=scoll:bep
34 IF b$="." AND w>0:w=w+inc:bep
35 IF b$="." AND w<0:w=w-inc:bep
36 IF b$="m":pain=-1:era=0:POKE_W 163980,30
```

PROG OF THE MONTH


```

37 IF b$="p":pain=1:era=0:bep:POKE_W 163980,30000
38 IF b$="e":pain=1:fc01=fc01:tc01=tc01:scol1=scol:era=1:CLSf0:PRINTf0;"      Co
lour of background?":hold=in:chocol:temcol=in:in=hold
39 IF era=1:fc01=temcol:scol=temcol:tc01=temcol
40 IF b$="," AND w>=0:w=w-inc
41 IF b$="," AND w<0:w=w+inc
42 IF b$="="
43 IF z<0:z=z-zcor
44 ELSE :z=z+zcor
45 END IF
46 IF b$="-"
47 IF z<0:z=z+zcor
48 ELSE :z=z-zcor
49 END IF
50 IF hor$="u"
51 IF per$="r":w1=w-2*(w*depth/per)-1:END IF
52 IF per$="l":w1=w+2*(w*depth/per)+1:END IF
53 z1=z-(z*depth/hor)*((hor-ro)/(hor-ro+z))+1
54 END IF
55 IF hor$="d"
56 z1=z-(z*depth/hor)*((hor+ro)/(hor+ro-z))-1
57 IF per$="r":w1=w+2*(w*depth/per)+1:END IF
58 IF per$="l":w1=w-2*(w*depth/per)-1:END IF
59 END IF
60 IF b$="z":dev=dev-2E-2*inc
61 IF b$="x":dev=dev+2E-2*inc
62 IF b$="k":dev1=dev1-2E-2*inc
63 IF b$="j":dev1=dev1+2E-2*inc
64 IF b$="t" AND q$="c":dev2=dev1:dev1=-dev:dev=-dev2
65 IF b$="t" AND q$="t":turnover=1-turnover
66 IF turnover=0 AND q$="t":z=z-(2*z):z1=z1-(2*z1)
67 END DEFine inpu2
68 DEFine PROCedure reset
69 x=256:y=113:conv:era=0:OVER 1:te=0:fil=1:comp=0:miro=0:dev=2.7:dev1=3.63:xo=1
:FILL fil:POKE_W 163980,30:comma=1
70 pap=0:re=0:in=2:mov=0:size$="n":hor$="u":per$="r":w=27:z=18:n=0:o=0:p=0:turno
ver=0:p2=0:solid=3
71 ra=20:in=2:INK in:paral=0:DIM b$(1):inc=2:ecen=1:tilt=0:INKf0,7:PAPERf0,2:low
=4:high=8
72 incl=0:dep=30:ang=20:depth1=dep:hor=506:per=669:pain=-1:SCALE a,0,0:zcor=1:
73 pix=2:inc=9
74 END DEFine reset
75 a=226:fc01=2:fc01=2:scol=210:scol=210:tc01=230:tc01=230:solid=3
76 setup
77 reset
78 shap
79 DEFine PROCedure shap
80 REPEAT sha
81 PAPERf0,2:INKf0,7:CLSf0:ATf0,1,0:PRINTf0;" (B)LOCK (T)RIANGLE (C)U
RVE (R)IBBON (Q)UIT"
82 void=1:pain=-1:era=0:incl=0
83 q$=INKEY$(-1)
84 IF q$="t":trig
85 IF q$="b":cube
86 IF q$="c":darc
87 IF q$="f":Files
88 IF q$="r":ribbon
89 IF q$="q": DELETE mdv1_mind:SBYTES mdv1_mind,131072,32768:STOP
90 conv
91 END REPEAT sha
92 END DEFine
93 DEFine PROCedure setup
94 WINDOW 512,226,0,0:CLSf0
95 WINDOWf0,512,30,0,226:INKf0,7:CLSf0:CLSf1:CLSf2
96 END DEFine setup
97 DEFine PROCedure curse
98 IF CODE (b$)=200 OR CODE (b$)=217 OR CODE (b$)=202:co=co+inc:END IF
99 IF CODE (b$)=208 OR CODE (b$)=202 OR CODE (b$)=194:ro=ro+inc:END IF
100 IF CODE (b$)=216 OR CODE (b$)=209 OR CODE (b$)=217:ro=ro-inc:END IF
101 IF CODE (b$)=192 OR CODE (b$)=194 OR CODE (b$)=209:co=co-inc:END IF
102 IF co<0 :co=0
103 IF co>512:co=512
104 IF ro<0:ro=0
105 IF ro>226:ro=226

```




```

106 incre
107 END DEFine curse
108 DEFine PROCedure color
109 IF f$="ON":FILL 1
110 END DEFine color
111 DEFine PROCedure conv
112 ro=226-y:co=(x*380/512)
113 END DEFine conv
114 DEFine PROCedure conv2
115 y=226-y:co=(co*512/380)
116 END DEFine conv2
117 DEFine PROCedure bep
118 BEEP 50,5
119 END DEFine bep
120 DEFine PROCedure cube
121 CLSf0:turnover=0
122 REPEAT cu
123 inpu2
124 INKf0,7
125 panel20
126 IF void=0:GO TO 128
127 OVER pain:cub
128 b$=INKEY$(-1)
129 avoid
130 IF void=0:GO TO 132
131 OVER pain:cub
132 IF b$="c":color:OVER xo:cub:OVER xo
133 IF b$="q":OVER 0:CLSf0:RETurn
134 END REPEAT cu
135 FILL 0:conv2
136 END DEFine cube
137 DEFine PROCedure cub
138 IF solid=3
139 FILL 0:color: INK scol:LINE co,ro TO co+incl,ro+z TO co1+incl-(((per-co)/ang
)-((per-co-incl)/ang)),ro1+z1 TO co1,ro1 TO co,ro:FILL 0:color
140 INK tcol:LINE co,ro TO co1,ro1 TO co1+w1,ro1 TO co+w,ro TO co,ro:FILL 0:colo
r
141 END IF
142 INK fcol:LINE co,ro TO co+incl,ro+z TO co+w+incl,ro+z TO co+w,ro TO co,ro:FI
LL 0:color
143 END DEFine cub
144 DEFine PROCedure col3
145 paus:hold=in:CLSf0:PRINTf0;"      Front colour? ":PAUSE 50:chocol:fcol=in:PRI
NTf0;"      Side colour? ":PAUSE 50:chocol:scol=in:PRINTf0;"      Top colour? ":PA
USE 50:chocol:tcol=in:in=hold
146 END DEFine col3
147 DEFine PROCedure inpu
148 fi
149 IF b$="i":paus:CLSf0:PRINTf0;"      Enter colour of ink ":chocol:INK in
150 incre
151 ove
152 END DEFine inpu
153 DEFine PROCedure paus
154 bep:pa=0
155 REPEAT pau
156 pa=pa+1
157 IF pa=50:EXIT pau
158 er$=INKEY$
159 END REPEAT pau
160 END DEFine paus
161 DEFine PROCedure thic
162 IF b$="d"
163 low=0:high=250:inc=1:CLSf0:hold=dep:dept
164 END IF
165 END DEFine thic
166 DEFine PROCedure begi
167 IF b$="e":bco=eco:bro=ero:bep
168 END DEFine begi
169 DEFine PROCedure conv3
170 bco=co:eco=co:bro=ro:ero=ro:begin=0:in=2:INK 2
171 CLSf0
172 END DEFine conv3
173 DEFine PROCedure fi

```



```

174 IF b$="f":fil=1-fil:OVER 1
175 IF fil=1
176 f$="ON"
177 ELSE f$="OFF"
178 END IF
179 END DEFine fi
180 DEFine PROCedure incre
181 IF CODE (b$)>=49 AND CODE (b$)<=57:inc=b$:bep
182 IF CODE (b$)=48:inc=50:bep
183 END DEFine incre
184 DEFine PROCedure com
185 IF incl>0:comp=ABS(incl*2)
186 IF incl=0:comp=0
187 IF incl<0:comp=-ABS(incl*.7)
188 END DEFine com
189 DEFine PROCedure dept
190 chodep:depth=value:depth1=depth:dep=hor/depth:ang=(dep*ang/hold)*((co1-co)/(
ABS(co1-co)))
191 IF per$="l" AND hor$="u":ang=-ang
192 IF per$="l" AND hor$="d":dep=-dep
193 IF per$="r" AND hor$="d":dep=-dep:ang=-ang
194 END DEFine dept
195 DEFine PROCedure persp
196 CLSf0:PRINTf0;" HORIZON: (U)p or (D)own ?"
197 hor$=INKEY$(-1)
198 IF hor$<>"u" AND hor$<>"d":GO TO 196
199 IF hor$="u":hor=506
200 IF hor$="d":hor=-280
201 CLSf0:PRINTf0;" PERSPECTIVE (L)eft / or (R)ight ? ":per$=INKEY$(-1)
202 IF per$="r":per=669:GO TO 205
203 IF per$="l":per=-300:GO TO 205
204 GO TO 201
205 CLSf0
206 END DEFine persp
207 DEFine PROCedure trig
208 CLSf0
209 REPEAT cu
210 inpu2:INKE0,7
211 panel20
212 IF void=0:GO TO 214
213 OVER pain:tri
214 b$=INKEY$(-10)
215 avoid
216 IF void=0:GO TO 218
217 OVER pain:tri
218 IF b$="c":color:OVER xo:tri:OVER xo
219 IF b$="q":OVER 0:CLSf0:RETURN
220 END REPEAT cu
221 FILL 0:conv2
222 END DEFine trig
223 DEFine PROCedure tri
224 FILL 0:color
225 IF solid=3
226 IF turnover=0:INK tcol:LINE co,ro TO col,roi TO col+w1,roi TO co+w,ro TO co,
ro:FILL 0:color
227 INK scol:LINE co+w,ro TO co+incl+(w/2),ro+z TO co+incl-(((per-co)/ang)-((pe
r-co-incl)/ang))+w/2,roi+z1 TO col+w1,roi TO co+w,ro:FILL 0:color
228 INK scol:LINE co,ro TO co+incl+(w/2),ro+z TO co+incl-(((per-co)/ang)-((per-
co-incl)/ang))+w/2,roi+z1 TO col,roi TO co,ro:FILL 0:color
229 END IF
230 INK fcol:LINE co,ro TO co+incl+(w/2),ro+z TO co+w,ro TO co,ro:FILL 0:color
231 IF turnover=1 AND solid=3:INK tcol:LINE co,ro TO col,roi TO col+w1,roi TO co
+w,ro TO co,ro:FILL 0:color
232 END DEFine tri
233 DEFine PROCedure panel20
234 IF comma=1:ATf0,0,0:PRINTf0;" WIDTH(<>) ";w;" HEIGHT(+/-) ";z;" (SOLID ":A
Tf0,1,0:PRINTf0;" (D)EPth ";depth1;" (M)OVE (C)ONFIRM (O)VER";xo;" "
235 IF comma=2:ATf0,0,0:PRINTf0;" (I)NKS : STEP(0-9) ";inc;" : (Q)UIT ":AT
f0,1,0:PRINTf0;" (V)P ";hor$;" / ";per$;" : (F)ILL ";f$;" : (T)URN "

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Continued in April issue

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
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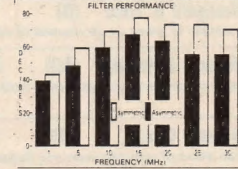
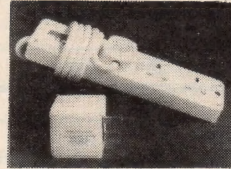
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<i>From fairway to green on 50 courses of varying difficulty</i>					
5. Williams & Holliday	(AO)	Paladin	£5	Apr	70
<i>The basis of our games programming series — a Space Invaders-type game written entirely in machine code</i>					
6. Richard Cross	(MB)	Sprite Animation	£2	Apr	50
<i>A subtle blend of machine code and SuperBasic which produces a versatile sprite designer and high-speed animator</i>					
7. Steve Deary	(B)	Pacman	£1	Mar	20
<i>A reasonably fast rendition of the famous arcade favourite</i>					
8. Andy Carmichael	(B)	Family Tree	£3	Aug	100
<i>Archive program and database for setting-up and displaying large family trees</i>					
9. James Lucy	(L)	Composer	£3	Oct	50
<i>Composer and play sheet music on the QL</i>					
10. Mathew Capp	(B)	Miners	£2	Aug	30
<i>A nail-biting management simulation which puts you in charge of the NCB</i>					
11. P J Smith	(B)	*DIY Adventure	£1	Feb	60
<i>A skeleton framework where you have to slot in the details to create your bespoke adventure</i>					
12. R Green	(B)	Othello	£1	Aug	25
<i>A 3D version of the well-known board game Othello for one or two players</i>					
13. S J Ackers	(S)	*Touch Type	£4	Aug	80
<i>Touch-typing course — 14 lessons, on-screen keyboard, 800+ word vocabulary and WPM readout</i>					
14. Rob Sherratt	(AO)	FCOPY	£4	Mar'86	80
<i>A machine code Microdrive utility for turbocharged file copying</i>					
15. Alan Prior	(B)	World Map	£2	Mar'86	80
<i>A high-resolution multi-coloured map of the world for geography buffs</i>					
16. J M Dower	(B)	Mushyman	£2	Jun/Jul'86	15
<i>Mushroom munching arcade action</i>					
17. Tony Quinn	(S)	*CAD QL	£4	Sept'86	180
<i>Professional features include rubber banding and user-definable symbol library</i>					
18. Stuart Campbell	(MB)	Attack of the Things	£3	Oct'86	45
<i>Can you repulse the attacking Things?</i>					
19. Karl Jeffery	(MB)	Starport 2001	£3	Nov'86	40
<i>An authentic version of the arcade game Galaxians</i>					
20. Marcus Jeffery	(S)	QL Go	£4	Apr/May'86	40
<i>A must for strategy games enthusiasts</i>					
21. J P Hartrey	(B)	Britain	£2	Nov'86	20
<i>Improve your geography knowledge with this round Britain quiz</i>					
22. KBG Judson	(B)	Darts	£2	Dec'86	30
<i>The popular pub pastime in pixels</i>					
23. Neil Taylor	(S)	Window Designer	£2	Feb'87	40
<i>On-screen window designer</i>					
24. J. F. Tydeman	(S)	Design 3D	£4	Mar'87	200
<i>An extensive utility for the production of 3D Screen designs</i>					

MICRODRIVE EXCHANGE

READY
TO RUN
SOFTWARE

Program of the month

Design 3D is one of the biggest programs ever featured in Microdrive Exchange. In addition to the Basic program listed in The Progs, it includes a 2D drawing program and a suite of graphics and filing utilities.

The programs have been linked and compiled using Supercharge and, in total, are more than 60K long. Some of the facilities of the 3D program are explained in The Progs pages. The 2D graphics function includes facilities for drawing arcs, rectangles, triangles and circles, together with commands for their manipulation, such as Rotate.

The utilities are contained in a separate program which can be accessed from the main menu. Facilities include dimensioned text input, re-colour and files. Two extremely useful functions are Pan, which enables you to define a screen block and a move it around; and Mind, with which you can store a part of the screen temporarily on which you are working, in case you make a mess of it.

3D Design is supplied complete with instructions in a Quill document file on the Microdrive.

There is a slight change to the order form this month. Please indicate the numbers (1-24) of the programs you require in the boxes provided.

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When ordering back issues, it is best to ensure that the copy you require is available by telephoning Anna Morrison on 01-222 9090. Please enclose a cheque/PO payable to *Sinclair QL World*. Rates for back issues are £2 per copy for the U.K., £3 for overseas.

O R D E R F O R M

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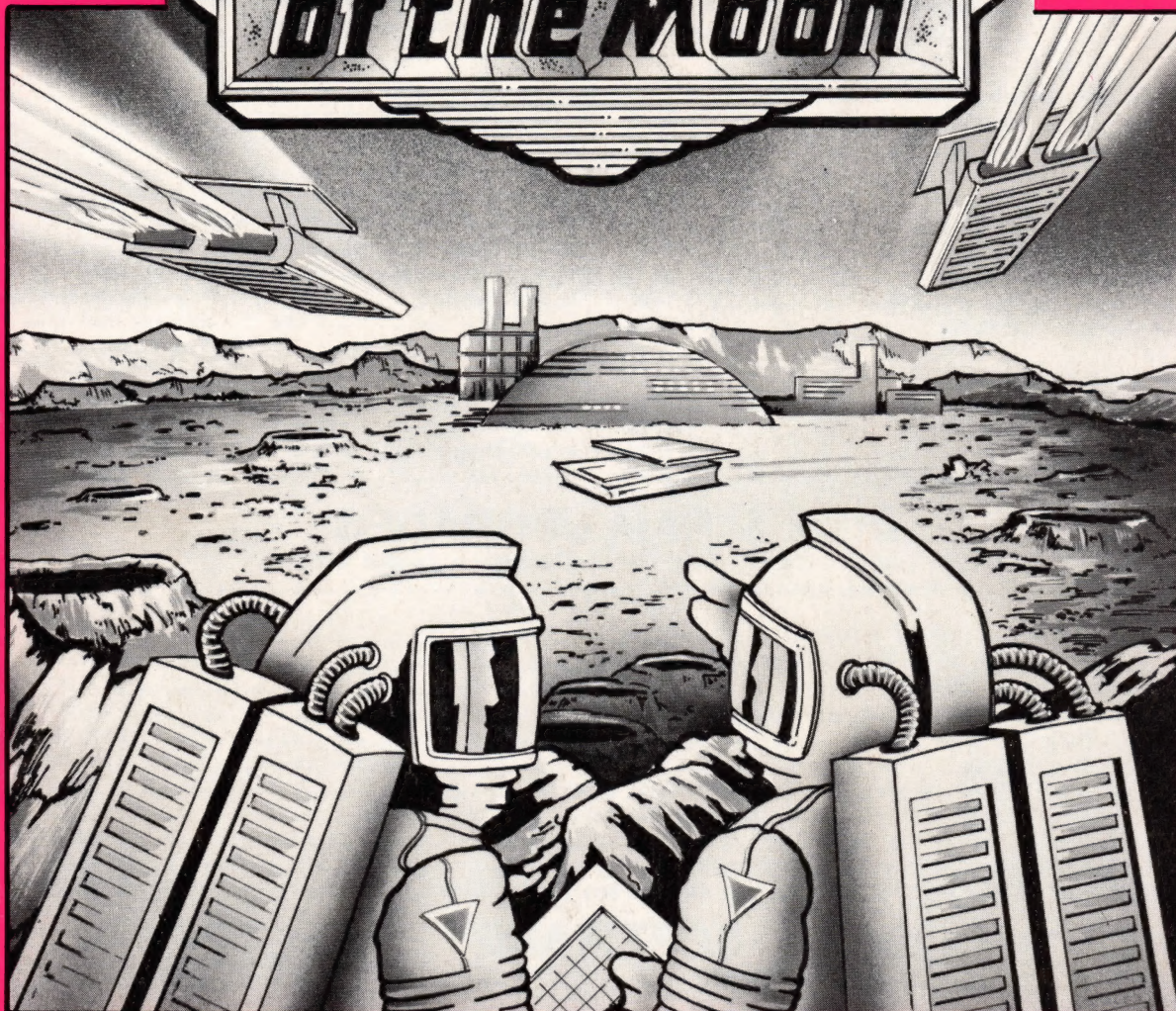
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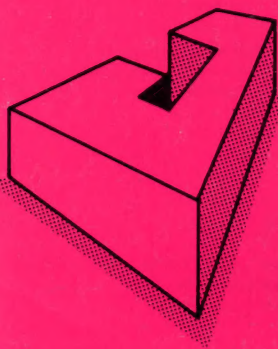
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